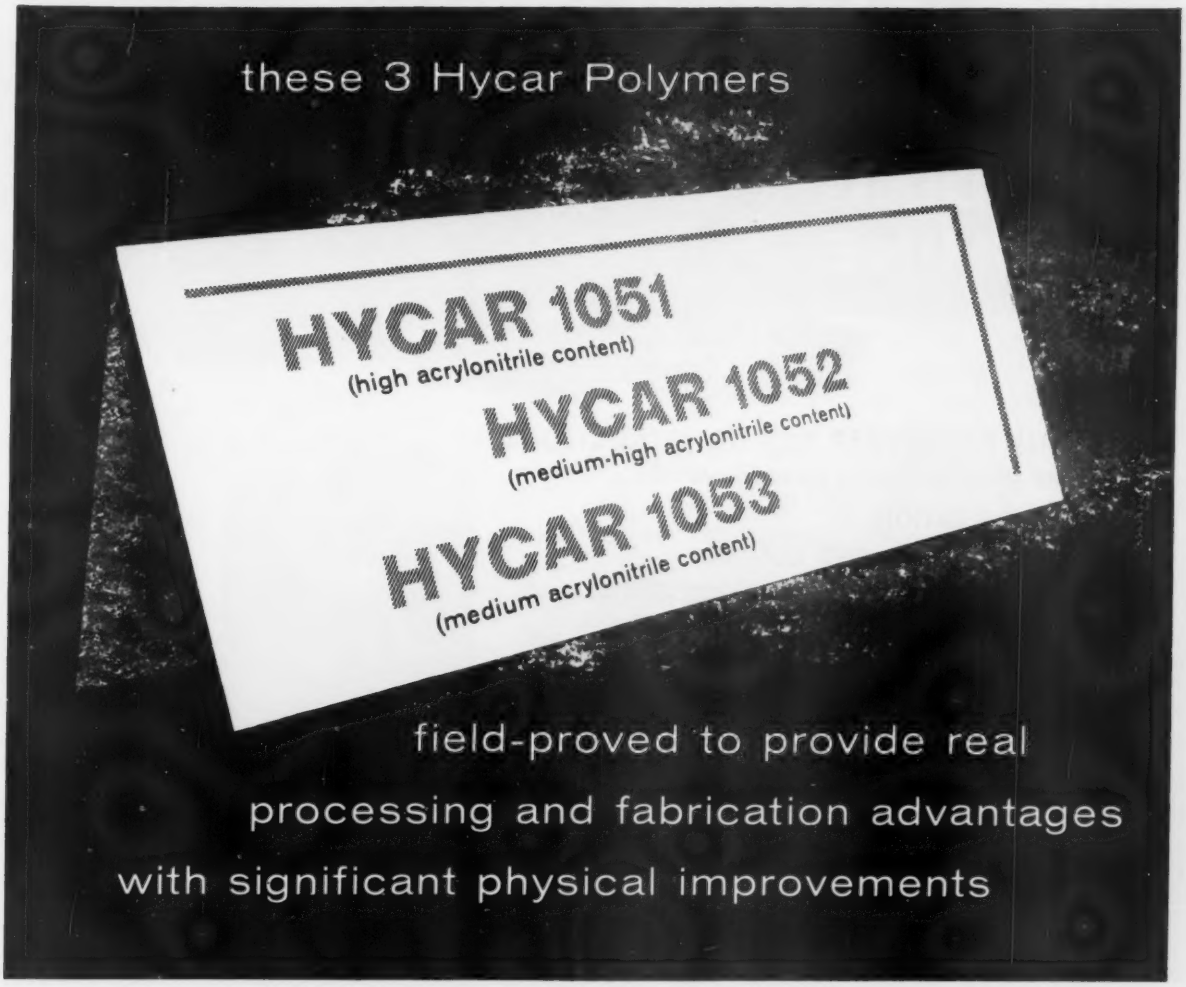
Another new development using

B.F.Goodrich Chemical *raw materials*



HERE ARE THE FACTS:

- ***This new series is a major improvement of nitrile rubber to materially aid fabrication, give superior end product properties.***
- **combines a range of oil and water resistance superior to other nitrile rubbers.**
- **improved tensile with higher elongation and lower moduli.**
- **excellent solubility both milled and unmilled to give lower cement viscosities.**
- **excellent aging and abrasion properties.**
- **blends easily with GR-S and other rubbers.**
- **blends easily to modify many resins.**

Get samples or further information on these three Hycar rubbers by writing Dept. CA-11, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
REG. U. S. PAT. OFF.
Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

NEW

NRM MODEL 58*

TIRE BUILDING MACHINE

BUILDS ALL PASSENGER TIRE CONSTRUCTIONS

Increases production... profit, with

- ★ **FASTER OPERATION**
- ★ **SIMPLER TOOLING AND CONTROL**
- ★ **GREATER ACCESSIBILITY FOR ADJUSTMENT AND MAINTENANCE**

The Model 58 Tire Building Machine is NRM's latest answer to the tire industry's need for faster-working, more *versatile* machines to provide greater production—and therefore greater profit—on building passenger tires of all sizes and constructions.

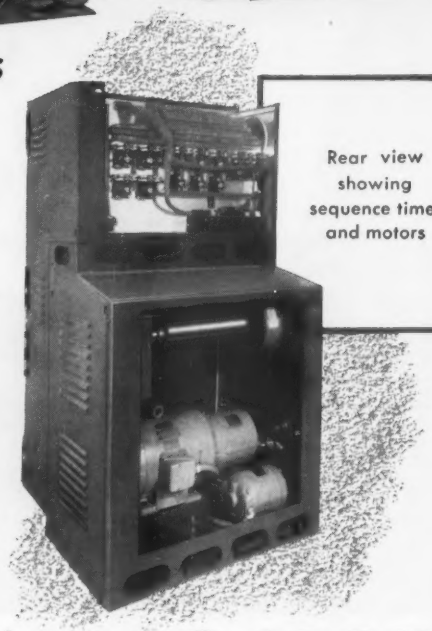
Increasing production capacity of the Model 58 is faster ply-down, bead-set, and turn-up operation, and greater ease of changing from 2-2 to 3-1 or 4-0 and 4-2 construction. Either 2, 3, or 4 plies can be placed on the drum before the turn-down, bead-set and turn-up operations. The constructions are changed by merely turning a selector switch on the panel.

Greater accessibility to sequence timer and motors is provided, as shown in the rear view photo of the machine, by having moved all machine adjustments either to the lower front compartment, or to other convenient locations.

Contributing to the simpler, more efficient tooling and control is a newly designed two-compartment panel having all electrical components in the top of the cabinet, with valves, tread stitcher and bead adjustments, and one-revolution device in the lower compartment.

Tires can be constructed with or without chafers and breakers, and with either flipped or standard beads. Check the table of capacities, and contact us for more information on the NRM Model 58 Passenger Tire Building Machine.

*Also available without sequence timer as Model 60RS.



Rear view showing sequence timer and motors

CAPACITIES

Drum diameters	13" to 22"
Drum shoulder sets	11½" to 28"
Bead diameters from	12" to 20"
Maximum ply width	35½"
Green tire clearance	26"

2076-A

NATIONAL RUBBER MACHINERY COMPANY

NRM

Creative Engineering

General Offices and Engineering Laboratories: 47 West Exchange St., Akron 8, Ohio

WEST: S. M. Kipp, Box 441, Pasadena 18, Cal.

EXPORT: Gillespie & Company, 96 Wall St., New York 6, N. Y.

Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

DECEMBER, 1959 VOL. 86, NO. 3

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*Appears every other month

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Indexed in Industrial Arts Index and Engineering Index

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Highlights Sidelights of the News . . .

December, 1959

Over 1,500 persons were in attendance at the International Rubber Conference held in Washington, D. C., on November 8 to 13 . . . The meeting featured the presentation of some 70 technical papers and exhibits of instruments, processing equipment, raw materials and publications . . . The meeting also featured the presentation of the Charles Goodyear Medal Lecture by Dr. F. H. Banbury (page 465).

The annual meeting of the Rubber Manufacturers Association, Inc., held on November 20 in New York City, attracted some 200 persons who gathered to hear talks by George R. Vila (U.S. Rubber) and Earl Hathaway (Firestone) . . . The meeting also included a panel discussion on the "Legislative Impact on Business" . . . Luncheon speaker for the occasion was General Carlos P. Romulo, Philippine Ambassador to the United States (page 474).

Sun Rubber Co. has filed an amended petition in federal court to pay unsecured creditors . . . Under the plan, creditors who are due amounts up to $100 would be paid in cash, while 10 percent or $100, whichever is greater, would be provided for claims in excess of $100. The petition also asks payment in full on all claims on or before July 10, 1960 (page 479).

The Rubber Manufacturers Association and ten of its members have been fined a total of $177,500 for violating the Sherman Antitrust Act . . . The indictment charged that the defendants had conspired in unreasonable restraint of trade to fix prices in the flat belting field . . . The Association and the ten firms pleaded nolo contendere to the indictment . . . By their plea, they accepted the charges against them, but did not indicate their guilt (page 493).

Directors of the Goodyear Tire & Rubber Co. have authorized a three-for-one- stock split . . . The split was accomplished by issuing two additional shares to stockholders of record November 16 for each share held on that date (page 473).

Thomas Hancock, English inventor (1786-1865) was added to the International Rubber Science Hall of Fame at the University of Akron at the annual Hall of Fame Banquet on November 20 . . . He is the sixth person to achieve this distinction (page 480).

1959-60 Review and Preview

To be published in the January, 1960 issue of this journal, this editorial feature will review events of the past year and give indications of what may be expected during 1960.

CARBON BLACKS

Wyex EPC
Easy Processing Channel Black

Arrow MPC
Medium Processing Channel Black

Essex SRF
Semi-Reinforcing Furnace Black

Modulex HMF
High Modulus Furnace Black

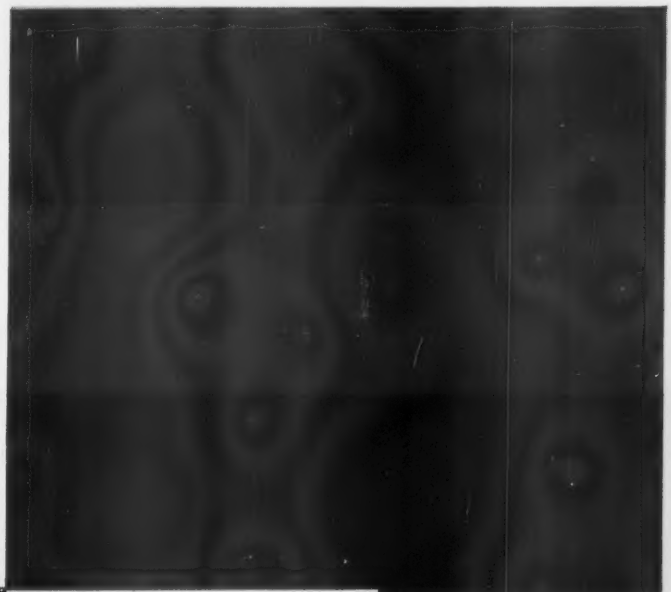
Aromex CF
Conductive Furnace Black

Aromex HAF
High Abrasion Furnace Black

Aromex ISAF
Intermediate Super Abrasion Furnace Black

Arovel FEF
Fast Extruding Furnace Black

Arogen GPF
General Purpose Furnace Black



CLAYS

Suprex Clay
High Reinforcement

Paragon Clay
Easy Processing

Hi-White R
White Color

LGB
Very low grit, high reinforcement

LGP
Very low grit, easy processing

Polyfil C, X* and F*
Fine particle, light color, water fractionated

*also available in spray-dried form

RUBBER CHEMICALS

Turgum S, Turgum SB

Natac

Butac
Resin-Acid Softeners

Aktone
Accelerator Activator

Zeolex 23*
White Reinforcing Pigment

*also available in spray-dried form

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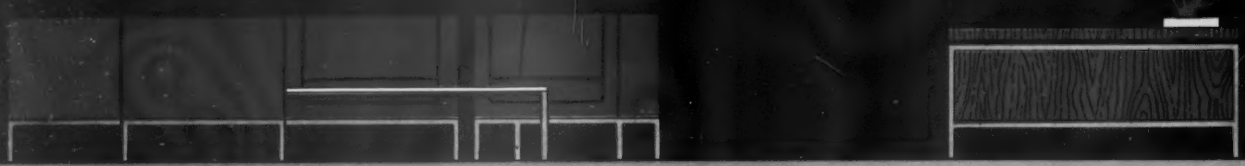

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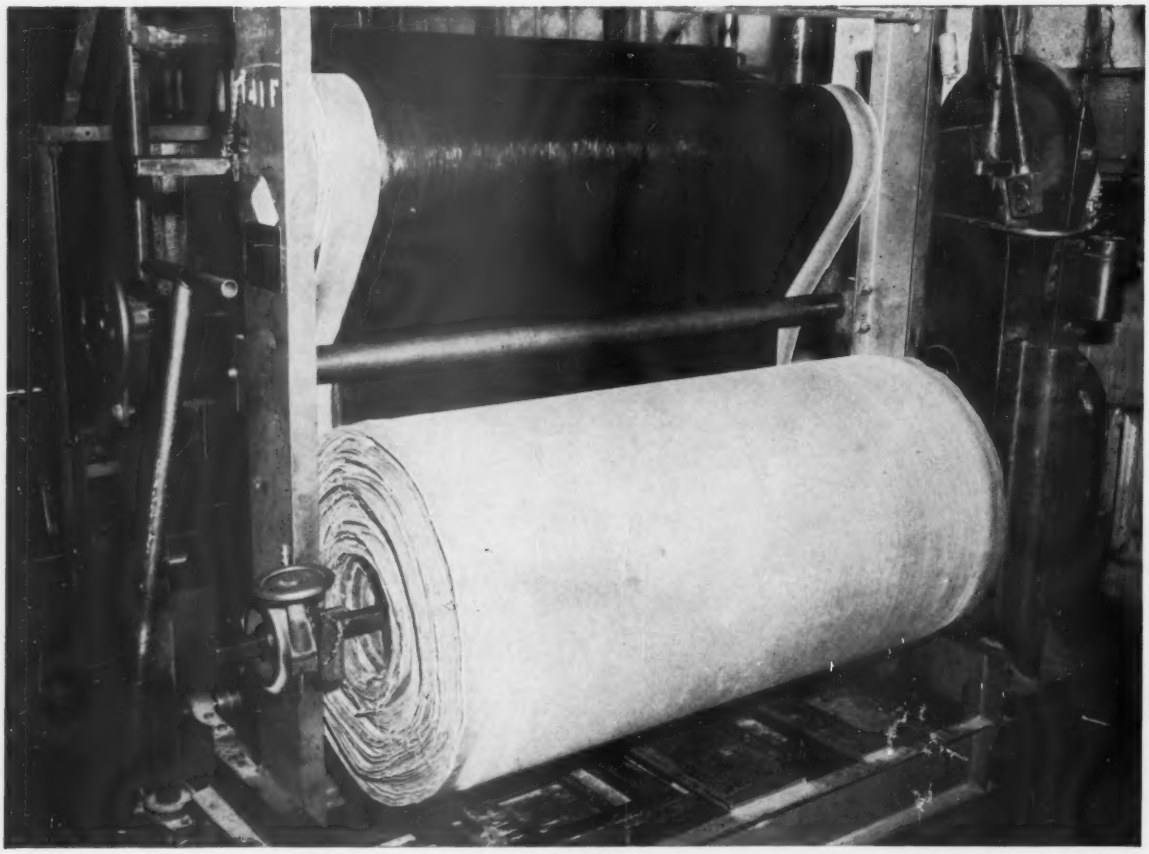

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portfolio

on PLIOFLEX

—7 pages of idea-sparking product news about America's most popular synthetic rubber

GOODYEAR
CHEMICAL DIVISION

Portfolio starts
on next page—

PLIOFLEX PORTFOLIO COVER
PLIOFLEX FOR HOUSEWARES
PLIOFLEX FOR FLOOR COVERINGS

Photo courtesy Beebe Rubber Company, Nashua, N. H.

Sure way to keep a step ahead

Keeping a step ahead, in any field, often boils down to having a bright idea. And that's what you'll find in the *RIPPLE® Sole. Its unusual comfort, resilience and grip are virtually assured through use of a high-quality rubber compound–one based on PLIOFLEX.

Why Plioflex? Its lightness of color, ease of processing, excellent uniformity, toughness and resiliency are the main reasons for its growing popularity–not only in soles, but in other quality rubber products which must be produced economically and efficiently.

If your product needs a lift, PLIOFLEX may be your answer. For detailed information on PLIOFLEX and other products in a complete line of synthetic rubbers and rubber chemicals–plus full technical assistance–write Goodyear, Chemical Division, Department L-9419, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Plioflex–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio *TM–Ripple Sole Corporation

Photo courtesy Rubbermaid, Inc., Wooster, Ohio

New way to lighten overloaded budgets

Eye-catching color is a "must" in the manufacture of many products, but particularly so in rubber housewares. Equally important in the highly competitive housewares market is the matter of cost. Color opens the sale, but real quality at reasonable cost will always close the sale.

Notice how the housewares above—made by an established leader in the field—blend colorful good looks with readily apparent value. A key reason for their sales success: they contain PLIOFLEX 1713, new oil-extended synthetic rubber by Goodyear.

Used in combination with other rubbers, new PLIOFLEX 1713 was chosen by the firm for its excellent color characteristics, ease of processing, high uniformity and low odor level. What's more, it costs several cents less per pound than previously used polymers, yet can be compounded to maintain end product quality.

Perhaps new Plioflex 1713 can lighten your budget, too. For more information – plus latest *Tech Book Bulletins* on PLIOFLEX 1713 and a full line of synthetic rubbers and rubber chemicals—write Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Plioflex—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

PLIOFLEX FOR HOUSEWARES

PLIOFLEX FOR FLOOR COVERINGS

PLIOFLEX PACKAGING

PLIOFLEX FOR BATTERIES

Photo courtesy Exide Industrial Division, Electric Storage Battery Co., Philadelphia, Pa.

Want a battery of compliments?

If you're looking for a product that will win compliments everywhere, why not take a lesson from the manufacturer of the big batteries shown above. For he has learned through experience, that some jobs are just made to order for PLIOFLEX rubber.

His particular problem lay in finding the right material for the battery cases. Conventional container materials just didn't have the strength or resilience to withstand the shock, pressure and abuse of rugged Diesel locomotive service. His answer was to pioneer the use of fully molded, hard rubber cases and covers.

At first, natural rubber was used. But then his case supplier suggested changing to PLIOFLEX. The reasons? PLIOFLEX is considerably more uniform, accepts a wider variety of fillers for easier compounding, processes more readily and cures faster. The end result: A better battery case at lower cost.

How can PLIOFLEX improve your product? Why not find out by writing, today, for full details and the finest in technical assistance. Address:

Goodyear, Chemical Division
Dept. L-9419, Akron 16, Ohio

GOODYEAR

CHEMICAL DIVISION

Plioflex—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Photo courtesy Globe Rubber Products Corporation, Philadelphia, Pa.

Fashion floor that's built for kicks

Spiked heels may be stylish on the foot, but they're "murder" on floors. Car floors, particularly, take a beating – not only from the pointed fashions of modern footwear, but from the constant pounding of foot-loose youngsters.

To take it, car floor covers or mats must be tough. And to sell, they must have color. One of the leading manufacturers in this field has found that PLIOFLEX, synthetic rubber by Goodyear, has the lasting qualities they require. It has also enabled them to make a more sales-appealing product at a substantial saving.

Want proof? Just look at the clean, crisp color of the floor mat above. Consider, too, the assured processability of PLIOFLEX *plus* its high uniformity and exceptional resistance to aging.

It all adds up to economical production of a sales-appealing product. To add appeal to *your* product without adding to your costs, check the advantages of PLIOFLEX. For full information–plus latest *Tech Book Bulletins* on PLIOFLEX and a full range of synthetic rubbers and rubber chemicals–write Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Pliofiex–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

PLIOFLEX FOR FLOOR COVERINGS · PLIOFLEX PACKAGING AND [illegible]

PLIOFLEX FOR BATTERIES

PLIOFLEX FOR TIRES

Both tires shown here have traveled 14,000 miles under identical conditions. Sidewall on right was made with PLIOFLEX "C" type rubber stabilized with new WING-STAY 100.

Now—rubber that keeps its age a secret

Whirling around a test track—or spinning through traffic—tires *age* with wear. The effects of this aging process show up most often in the sidewalls, where small cracks appear. Not only do they mar the looks of the tire, they rob it of strength and cut into its service life.

What causes cracking? Two things, mainly—atmospheric oxygen and ozone. To combat them, antioxidants have been developed. So have antiozonants. *But not until now* has a truly effective *combination* of antioxidant and antiozonant been perfected. And that's WING-STAY 100 by Goodyear.

The superior protection of Wing-Stay 100 can be yours in four new PLIOFLEX rubbers. Dynamic aging resistance thus becomes another key advantage of PLIOFLEX 1500C, 1710C, 1712C, and 1714C – along with assured processability, high uniformity and excellent physical characteristics.

For more information and complete technical service on PLIOFLEX "C" type rubbers—plus other rubber chemicals and a full line of synthetic rubbers—write:

Goodyear, Chemical Division, Dept. L-9419,
Akron 16, Ohio

GOODYEAR

CHEMICAL DIVISION

Wing-Stay, Plioflex—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Choice combination: Plioflex in the package you prefer!

Look closely at the PLIOFLEX packaging materials above and you'll notice that Goodyear has put some important "extras" into their design. Example: PLIOFLEX bags are distinctively marked and color coded for split-second identification, more efficient storage. Inside those 5-ply polyethylene-laminated bags are PLIOFLEX bales which can be talc dusted or wrapped in polyethylene film—depending on your need.

When it comes to shipping, once again—you call it. Bales or bags of PLIOFLEX can be shipped individually or in quantity on nonreturnable, no-charge wooden pallets. Prefer pallets? Palletized shipments come by truck or carload—take your pick. Bulk shipments? They arrive in special *unitized* containers—each one holding 33 film-wrapped bales.

"Seagoing Boxcars" may speed your order from our Houston warehouse. This unique sea-land system assures prompt, economical delivery to Eastern Seaboard customers. *Wherever* you need PLIOFLEX, you'll find it comes safely, swiftly from one of Goodyear's four strategically located supply points. And it comes ideally packaged for your *specific* purpose. More information on PLIOFLEX packaging and product advantages—plus latest *Tech Book Bulletins*—are yours for the asking. Write to: Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

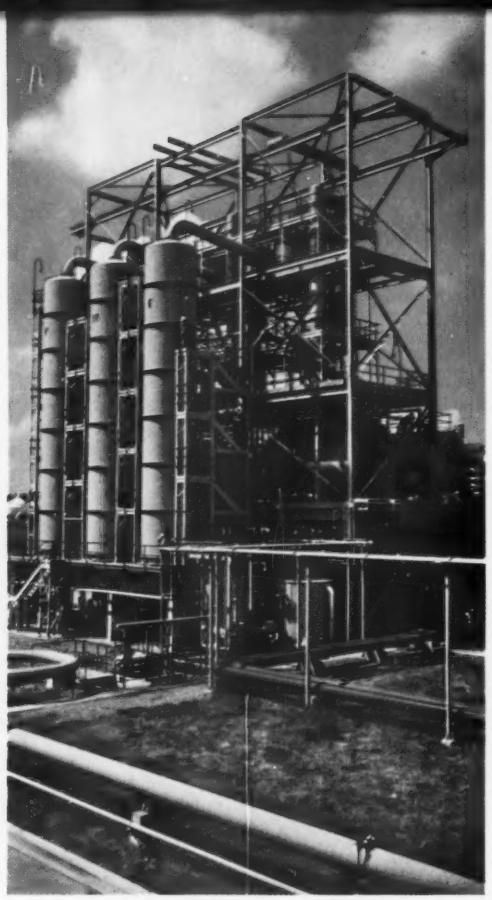
Plioflex—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

PLIOFLEX PACKAGING AND DELIVERY

PLIOFLEX FOR BATTERIES

PLIOFLEX FOR TIRES

PLIOFLEX PRODUCTION AND SERVICE



Goodyear Chemical Division plant in Houston, Texas, is world's largest facility for production of synthetic rubber.

Plioflex

America's most widely used synthetic rubber is produced at the world's largest synthetic rubber plant

For personalized service *fast* – Goodyear maintains a nationwide network of field offices–15 in all, strategically located in major U. S. cities. Each of these "nerve centers" has a staff of experienced, technically trained Chemical Division representatives. Their job: to make *your* job easier–with prompt, on-the-spot, authoritative assistance when and where you need it. With no obligation, of course.

For detailed data on Plioflex in easy-to-digest, down-to-earth language–Goodyear offers a continuing series of bulletins called *Tech Book Facts*. These bulletins cover types and properties, compounding, formulations–even test procedures. And they're full of graphs, tables and other visual aids. A complete set of these fact sheets is a "must" for every Technical Director, Chief Chemist or Plant Manager. They're yours for the asking.

WRITE TODAY to: Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

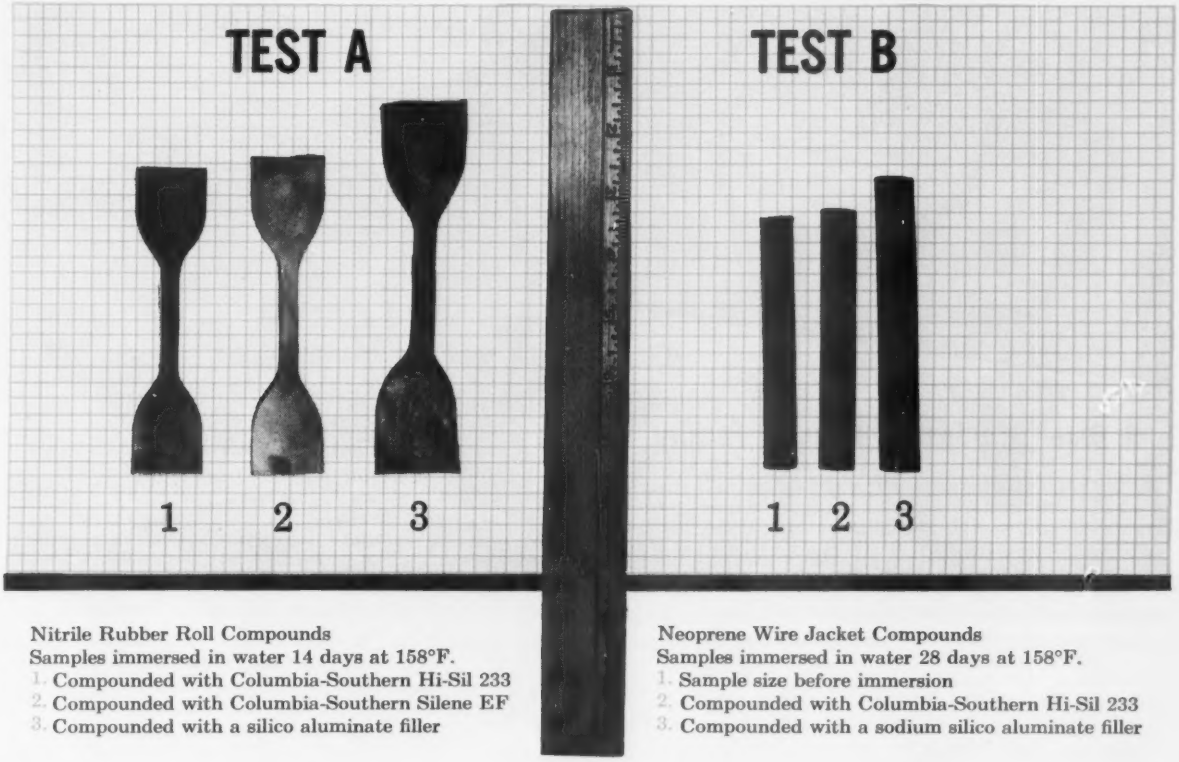
GOODYEAR

CHEMICAL DIVISION

Plioflex–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

HERE'S PROOF Columbia-Southern

Silene® and Hi-Sil® white reinforcing pigments reduce water absorption



Nitrile Rubber Roll Compounds
Samples immersed in water 14 days at 158°F.
1. Compounded with Columbia-Southern Hi-Sil 233
2. Compounded with Columbia-Southern Silene EF
3. Compounded with a silico aluminate filler

Neoprene Wire Jacket Compounds
Samples immersed in water 28 days at 158°F.
1. Sample size before immersion
2. Compounded with Columbia-Southern Hi-Sil 233
3. Compounded with a sodium silico aluminate filler

In each of these recent tests, the samples compounded with Columbia-Southern fillers exhibited the least amount of water absorption. The pictures tell their own story—and prove the definite advantages of using Columbia-Southern Silene and Hi-Sil fillers.

Naturally, this reduced absorption makes for better end products. For example, household appliance parts formulated with Columbia-Southern pigments will retain dimensional stability longer. Adhesive bonds on cemented shoe soling won't lose strength as rapidly . . . and the soles themselves won't gain as much weight during wear. Cable jackets will remain sound without excessive swelling. Textile, paper, and steel mill rolls will have longer life at size specifications.

Get the details on these new findings. A full technical report has just been prepared, describing the comparative water absorption of a variety of rubber compounds, both natural and synthetic, and will be sent out to our regular mailing list immediately after publication. Use the coupon to get your copy if you do not regularly receive Columbia-Southern technical literature.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
A Subsidiary of Pittsburgh Plate Glass Company

Columbia-Southern Chemical Corporation
Room 1929A, One Gateway Center
Pittsburgh 22, Pennsylvania

Please send me a copy of your report on water absorption in rubber compounds.

Name_____

Title_____

Company_____

Street_____

City_____ Zone____ State_____

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Sealed Bid Opening February 9, 1960

LOUISVILLE BUTADIENE PLANT

LOUISVILLE, KENTUCKY

VIEW OF ALCOHOL STORAGE AREA

A Blue-Chip Special Purpose Facility

The Louisville Butadiene Plant, located in the "Rubbertown" area of Louisville, Kentucky is an exceptional offering for the astute investor. This special purpose plant was designed to produce butadiene from ethyl alcohol yet it is easily convertible to many other processes.

Located on a prime industrial site along the Ohio River, the facility is in marvelous condition. High volume tankage and processing equipment, low-cost transportation, complete utilities, considerable room for expansion, and a fine labor force are indications that this plant has all the requisites for high yield on the investment dollar.

All previous restrictions as to use or National Security clause have been lifted. If your company's processes are in any way similar to that of this facility, you may find that the purchase and conversion costs are minor compared to the productive capacity and advantageous location of the plant.

Is your organization ready for expansion or are you looking for a sound practical investment? In either case, the Louisville Butadiene Plant is well worth your immediate investigation.

This coupon will bring you bid form G-Kentucky-465, brochure and all information on the plant, land and equipment.

CONTROL ROOM—BUTADIENE UNIT

SPECIFICATIONS

Plant Consists of:
- Approx. 139 acres
- 24 permanent buildings of brick, steel and concrete construction plus many large auxiliary structures.
- Railroad Sidings, Parking Areas.
- Room for expansion.

Tankage:
- 10 storage tanks, 12,000,000 gallon capacity at atmospheric pressure.
- Three Hortonspheres, 750,000 gal. capacity at pressures up to 75 p.s.i.
- Large barge loading facilities.

Process Equipment:
- Plant consists of three processing units. Complete equipment list submitted with coupon request.

Utilities:
- Electricity, Natural Gas, Water, Water Treating, Steam, Waste Disposal, Fire Protection, Pumping Station available on site.

Rail & Barge Service:
- Plant served by spur of Kentucky and Indiana Terminal Railroad and by 5 barge lines.

ALL AS IS, WHERE IS

Bid Deposit 5% of bid price (max. deposit $50,000). Easy credit terms. Title conveyance by quitclaim deed and bill of sale without warranty.

SEALED BIDS will be opened on February 9, 1960 at 3 P.M. (CST)

GENERAL SERVICES ADMINISTRATION, Business Service Center
U.S. Courthouse, Room 575, Chicago 4, Illinois *RA*

Send immediately, complete details, specifications and bid form G-Kentucky-465 on the Louisville Butadiene Plant and site offered for sale.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

GENERAL SERVICES ADMINISTRATION

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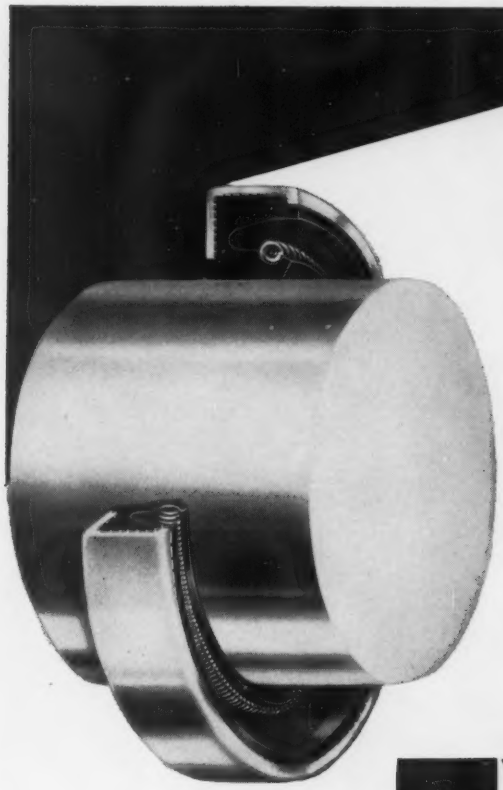

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coming events

1959

Dec. 18. Chicago Rubber Group, Christmas Dance, Hotel Morrison, Chicago, Ill.

Dec. 18. New York Rubber Group, Christmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 26-31. American Association for the Advancement of Science, 126th Annual Meeting, Morrison and La Salle Hotels, Chicago, Ill.

Dec. 27-30. American Statistical Association, Shoreham Hotel, Washington, D. C.

Dec. 28-29. American Chemical Society, Division of Industrial and Engineering Chemistry, Christmas Symposium, Johns Hopkins University, Baltimore, Md.

1960

Jan. 8. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

Jan. 9-15. Eleventh International Toy Fair, Harrogate, England.

Jan. 11-16. Sixth National Symposium on Reliability and Quality Control, Statler-Hilton Hotel, Washington, D. C.

Jan. 12-15. Society of Plastics Engineers, 16th Annual Technical Conference, Conrad Hilton Hotel, Chicago, Ill.

Jan. 20. Southern Ohio Rubber Group, Technical Meeting, Engineers Club, Dayton, Ohio.

Jan. 21. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

Jan. 21. Quebec Rubber & Plastics Group, Joint Technical Meeting with the Society of Plastics Engineers, Ruby Foo's Restaurant, Montreal, Quebec, Canada.

Jan. 25-28. Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Penna.

Jan. 25-28. Thirteenth International Symposium on Modern Methods in Analytical Chemistry, Coates Chemical Laboratories, Louisiana State University, Baton Rouge, La.

Jan. 29. Akron Rubber Group, Technical Symposium, Sheraton Hotel, Akron, Ohio.

Jan. 29. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

Jan. 30-Feb. 3. National Automobile Dealers Association, 43rd Annual Convention, Sheraton Park Hotel, Washington, D.C.

Feb. 1-5. American Society for Testing Materials, Committee Week, Hotel Sherman, Chicago, Ill.

Feb. 1-5. Instrument Society of America, Instrument and Automation Conference and Exhibit, Sam Houston Coliseum, Houston, Texas.

Feb. 2. Los Angeles Rubber Group, Technical Meeting, Biltmore Hotel, Los Angeles, Calif.

Feb. 2-4. Society of the Plastics Industry, 15th Reinforced Plastics Division Conference, Edgewater Beach Hotel, Chicago, Ill.

Feb. 5. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

Feb. 5-7. Boston Rubber Group, Ski Weekend, Bartlett Hotel, Bartlett, N. H.

Feb. 9. Association of Consulting Chemists & Chemical Engineers, Luncheon Meeting, Hotel Shelburne, New York, N. Y.

Feb. 11. Fort Wayne Rubber & Plastics Group, Technical Meeting, Van Orman Hotel, Fort Wayne, Ind.

Feb. 12-13. Southern Rubber Group, Technical Meeting, Shamrock Hilton Hotel, Houston, Texas.

Feb. 14-18. Hobby Industry Association, American Trade Show & Convention, Sherman Hotel, Chicago, Ill.

Feb. 17. Southern Ohio Rubber Group, Plant Tour, Modern Industrial Plastics, Dayton, Ohio.

Feb. 18-19. American Society for Quality Control, Textile Division, Annual Conference, Clemson House, Clemson, S. C.

Feb. 19. Connecticut Rubber Group, Technical Symposium, Waverly Inn, Cheshire, Conn.

Feb. 21-24. American Institute of Chemical Engineers, National Meeting, Biltmore Hotel, Atlanta, Ga.

Feb. 25. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

Feb. 26. Quebec Rubber & Plastics Group, Ladies' Night Dance, Victoria Hall, Montreal, Quebec, Canada.

Feb. 29-March 4. Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy & Exposition of Modern Laboratory Equipment, Penn - Sheraton Hotel, Pittsburgh, Penna.

March 1. Los Angeles Rubber Group, Technical Meeting, Biltmore Hotel, Los Angeles, Calif.

March 4. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

March 6-11. Tenth International Toy & Trade Fair, Hotel Statler Hilton, New York, N. Y.

March 7-16. American Toy Fair, Hotels New Yorker and Sheraton-Atlantic, New York, N. Y.

March 10-13. Pacific Automotive Show, City Auditorium, Denver, Colo.

March 11. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

March 17. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

March 17. Quebec Rubber & Plastics Group, Technical Meeting, Queen's Hotel, Montreal, Quebec, Canada.

March 18. Boston Rubber Group, Technical Meeting, Somerset Hotel, Boston, Mass.

March 30-31. Plastics Institute Conference on Polymeric Progress, William Beveridge Hall, London University, London, England.

March 30-April 1. Canadian Tire Dealers Association, Annual Meeting, Montreal, Quebec, Canada.

April 1. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

April 3-6. National Toy Show, Morrison Hotel, Chicago, Ill.

April 3-8. Sixth Nuclear Congress & Exhibit, New York Coliseum, New York, N. Y.

April 5-14. American Chemical Society, 137th National Meeting, Cleveland, Ohio.

April 7. Rhode Island Rubber Club, Spring Meeting, Pawtucket Country Club, Pawtucket, R. I.

April 8. Akron Rubber Group, Technical Symposium, Sheraton Hotel, Akron, Ohio.

April 8-9. Society of the Plastics Industry, 17th Western Section Conference, New Riviera Hotel, Palm Springs, Calif.

April 9-26. Fourth Osaka International Trade Fair, Osaka, Japan.

April 14. Fort Wayne Rubber & Plastics Group, Technical Meeting, Van Orman Hotel, Fort Wayne, Ind.

April 18-19. Conference on Automatic Techniques, Sheraton Cleveland Hotel, Cleveland, Ohio.

April 19. Association of Consulting Chemists & Chemical Engineers, Forum Meeting, Hotel Shelburne, New York, N. Y.

April 20. Quebec Rubber & Plastics Group, Technical Meeting, Queen's Hotel, Montreal, Quebec, Canada.

April 25-26. Society of the Plastics Industry (Canada), 18th Annual Canadian Section Conference, London Hotel, London, Ontario, Canada.

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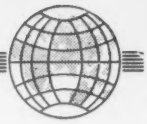

Santo Domingo—76,000 rubber plants have been distributed to Dominican Republic farmers by the Department of Agriculture, bringing the number of trees planted in the eastern region of the Republic this year to 176,000. The Department is concentrating on the ten varieties which give the highest yield.

Djakarta—Indonesia plans to export 30,000 tons of rubber to the Soviet Union in 1960 in accordance with a new trade agreement signed in Moscow recently.

Budapest—In Hungary's second five year plan, a polyethylene factory and a PVC factory, each with an additional output of 10,000 tons, are called for. A PVC plant, which will have an annual output of 6,000 tons, is already under construction.

Kuala Lumpur—The Malayan Cabinet sent a delegation to a meeting of the General Agreement on Tariffs and Trade which was held in Tokyo in November. Malaya is one of a number of countries which does not recognize Japan as a GATT member.

Bonn—The Soviet Union has placed orders for 150 million marks' worth of machinery for the production of polyethylene plastics. Plants producing the plastics are expected to be ready to operate in about two years.

Buenos Aires—Nuodex Products Co. has granted a license to Nuodex Argentina, S. A., to manufacture a line of paint driers and specialty chemicals. Nuodex Argentina was formed by Heyden Newport and a group of English and Argentine businessmen.

Kuala Lumpur—Representatives of the National Union of Plantation Workers and the Malayan Planting Industries Employers' Association met recently to discuss the current wage agreement, which came into force on June 1. Topics scheduled for discussion included payment for days not worked because of rain; tapping in difficult country; and the division of estates into three categories.

Accra—Ghana plans to intensify development plans for a rubber growing industry. A subsidy of £30 will be granted to every farmer who is able to cultivate one acre of rubber plantation in Ghana.

Athens—The Greek government has authorized the construction of a pneumatic tire factory by a group consisting of Societe International Pirelli of Basle, the Ethel Co. of Athens and several Greek businessmen.

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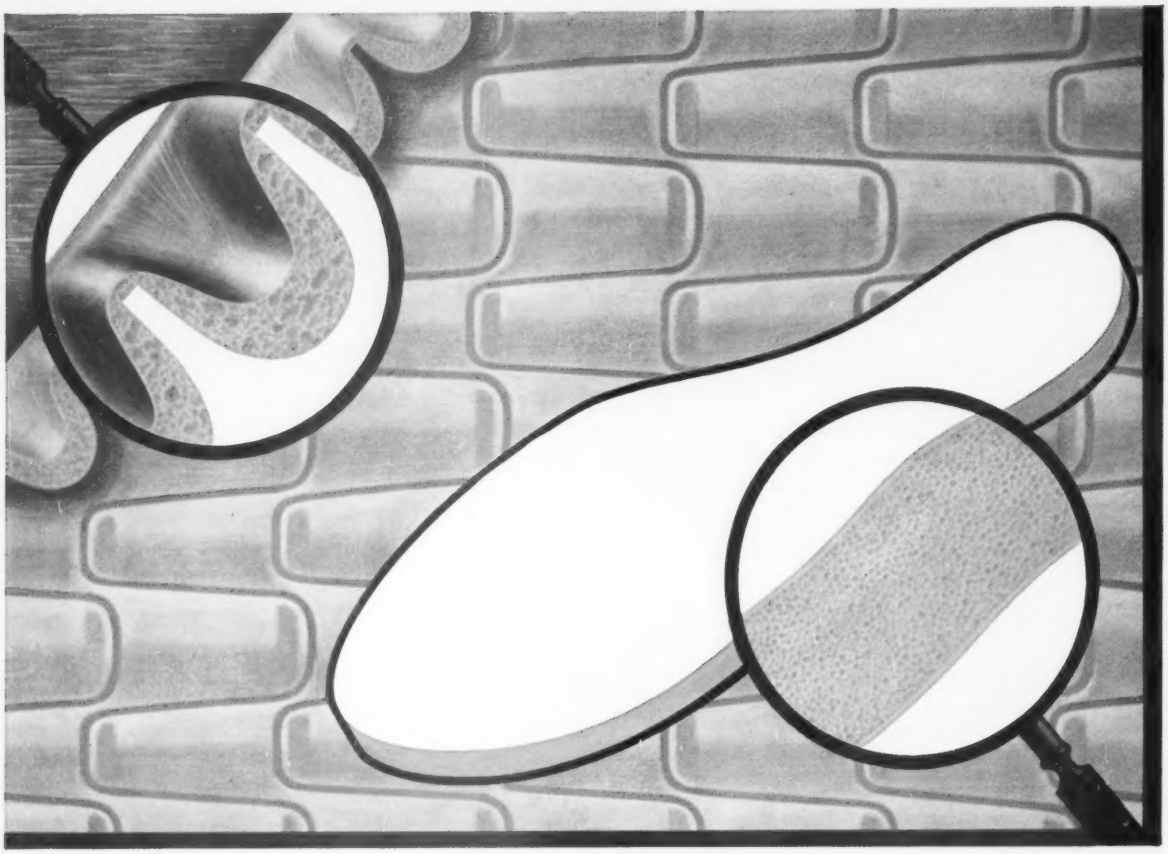

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Light Color—Non-staining and non-discoloring S-1509 is excellent for white stocks not only because of its own inherent light color but also because it eliminates discoloring peptizing agents.

Low Viscosity—S-1509 has a viscosity range of 30-38; it needs no breakdown and comes to you ready for immediate processing in sponge applications.

No Excessive Tack—S-1509 reduces the tendency of compounds to stick on the mill roll or mold surface.

Outstanding Physical Properties—Properties of S-1509 stocks closely compare with those of plasticized high Mooney counterparts such as S-1502 compounds.

Superior Mold Flow—Stocks made with S-1509 provide sharp design transfer from the most intricate mold to the finished product.

Low Water Absorption—Because S-1509 is coagulated with alum, it is recommended for applications which require low water absorption.

S-1509 may be used to advantage in other products than sponge: wherever a combination of the above features is desired.

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capitol cues

WASHINGTON STILL SEES GOOD BUSINESS AHEAD, despite the steel strike and the slowdown in activity it has brought. There is no fear of an early recession. But this doesn't mean that business is completely unaffected. The shutdown has toned down—and stretched out—the expansion that's ahead.

Between now and the end of the year, business will still turn up; in fact, some things may set records. But the rate will not match forecasts made last Spring. Steel will continue in short supply and inventory pipelines won't begin to fill until 1960. Even at year-end, mills will be filling orders placed before the strike. Normal deliveries must wait until Spring.

The strike's impact will be felt for a while by some lines.
- In autos, fourth-quarter assemblies will be 600,000 short of targets, but good dealer stocks will still keep sales high.
- In appliances, finished stocks are high, largely unaffected. Main effect of the strike has been to delay some new models.
- In construction, the strike's effects will show up in lags for some months yet, but the net effect won't be very large.
- In machinery, production was not hurt much by the strike.

Here's what government experts see in 1959's final quarter:
- Industrial production will near, or top, the record of June. That would be about a 5% gain, to 155% of the 1947-49 base.
- Retail sales will top last year's excellent fourth quarter. For many lines, business at Christmas will be the best ever.

And activity is expected to keep rising nicely well into '60. No leveling or softening is seen before the Summer, if then.

THE 1960 MODEL CARS ARE GETTING A GOOD RECEPTION from the consumer, to judge from early sales figures. Both standard and economy lines started well. During October, for instance, sales were more than double the rate hit in the same month of 1958, and volume was also considerably higher than in September. To be sure, steel shortages will hamper production for a while. But the sales put off this Fall may show up during 1960, lifting the total to a new record.

NO SIGNIFICANT EASING OF CREDIT is foreseen by officials in Washington for coming months. The need for money may not be as great as was expected when the steel strike first began. But businessmen, consumers, and local governments still need funds. Corporations, especially, will need money for tax payments, just when they'll be trying to rebuild inventories and to finance new plants. And the Federal Reserve shows no signs of reversing its tight-money program. Officials declare that they are still worrying over the dangers of inflation.

A SHARP DROP IN HOME-BUILDING NEXT YEAR is now being forecast by experts at the federal housing agencies. They are worried about continuing tightness of money and the tapering in government housing programs. As a result, the experts see new starts falling to around 1.1 million next year, from this year's total of 1,350,000. Some buyers are already balking at current high mortgage rates.

capitol cues (cont'd)

SOME IDEA OF THE ST. LAWRENCE SEAWAY'S IMPACT can now be obtained, as the first shipping season winds up. Railroads lost some grain traffic; volume at Eastern ports dropped 18 million bushels, while Great Lakes ports shipped many millions more. Trucks lost some domestic traffic but picked up business on hauling higher imports. Inland waterways lost bulk hauls, too.

> Seaway traffic has been running about 67% ahead of movements on the old shallow channel route. The total for this season may hit 17 million tons, including 7 million tons of grains, 5 million tons of ore, and the rest general and bulk cargos.

EXPORTS OF U.S. COMMERCIAL GOODS WILL RISE 6% in the next six to eight months, according to experts at the Commerce Department. Main reason: better business abroad. The areas that will see the biggest increases are Europe, Latin America, and Canada, which are getting more for materials they produce because of higher prices. Cotton and rubber and oil products will gain most.

KEEPING ENOUGH WORKING CAPITAL IN THE BUSINESS to meet monthly needs? Many firms do not, warns the Small Business Administration in a new booklet. The SBA booklet says that there is danger in times of prosperity in putting too much money into inventory and new equipment and not holding enough to pay current bills. "Watch Your Cash"—the SBA publication—provides guidelines for budgeting funds for such purposes as inventories, payables, new machines, etc. Write SBA, Washington 25, D. C., for Management Aid 105. It is free.

THIS IS THE SEASON FOR TAKING ANTI-INFLUENZA SHOTS and officials of the Public Health Service urge that businessmen arrange for their employees to do so. The shots are deemed 70% effective against main strains of flu virus, including the Asian type, when given in two doses two to four weeks apart. Officials see no flu epidemic, but local outbreaks will be numerous.

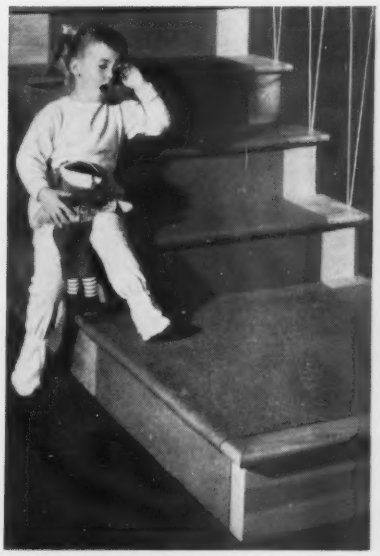
REPUBLICAN PROSPECTS FOR NEXT YEAR ARE EXCELLENT—that's the view of Washington political reporters. This is a far cry from November 1958, when the GOP lost heavily. The experts say that the Democrats would show large losses, if the 1960 national elections were to be held at this time.

> What's the basis for this size-up by those reporters polled? The Party has the best-known candidates—Vice President Nixon and Governor Rockefeller. The Republicans also have the best issues. The GOP is identified with a fight against inflation and Eisenhower has appropriated the peace issue for the Party. Prosperity is working for the GOP, too, but this could change.

A NEW THEORY OF THE CAUSES OF CREEPING INFLATION has been devised by analysts working for Congress' Joint Economic Committee. It suggests that inflation needn't be chronic and can exist when goods are plentiful. The blame for the inflation of 1956-58, for example, is placed on sudden large shifts in buying: home and auto sales fell, steel and machinery sales rose.

> Prices of steel and machinery went up, lifting the costs—and prices—of users...which meant nearly <u>every</u> other line. So the indexes soared. If this theory gains support—and it could—all tight-credit policies would seem pointless. You may see a push for selective price controls on scarce items.

Rainwear—colors stay bright



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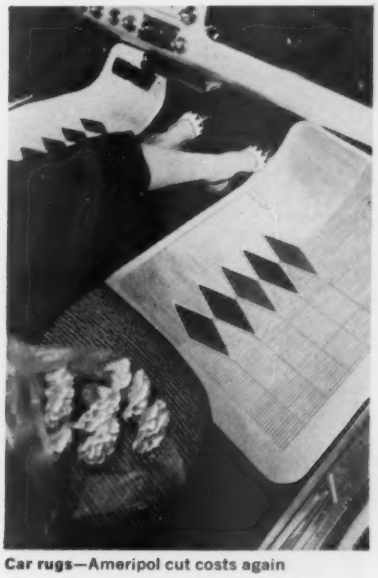

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Although it has been obvious in recent years that Soviet rubber technology and research is very vigorous and highly advanced, it has been extremely difficult because of the language barrier for those in Western countries to follow the technical progress being made there. This, in spite of the fact that the Russian rubber journal is a prolific source of original literature on the subject.

Now, however, through the cooperation of the British Government and the Research Association of British Rubber Manufacturers, cover-to-cover translations of "Kauchuk i Rezina," the Russian rubber journal, are available on every single issue.

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Typical articles published:

Synthesis and use of carboxylated latices for impregnating tire cord.

Preventing scorching in rubber stocks by using benzoates.

Carbon black structures and the tear resistance of vulcanizates.

Creep of rubbers at high temperatures.

Stock preparation procedures at the Dnepropetrovsk tire works.

Highly plasticized oil-extended butadiene-styrene rubber SCS-30AM.

Electrodeposition of carboxylated latices.

Ways of effecting further economies in the construction of plant for the synthesis of raw rubber and other organic compounds.

Changes in the properties of unvulcanized rubber stocks during processing.

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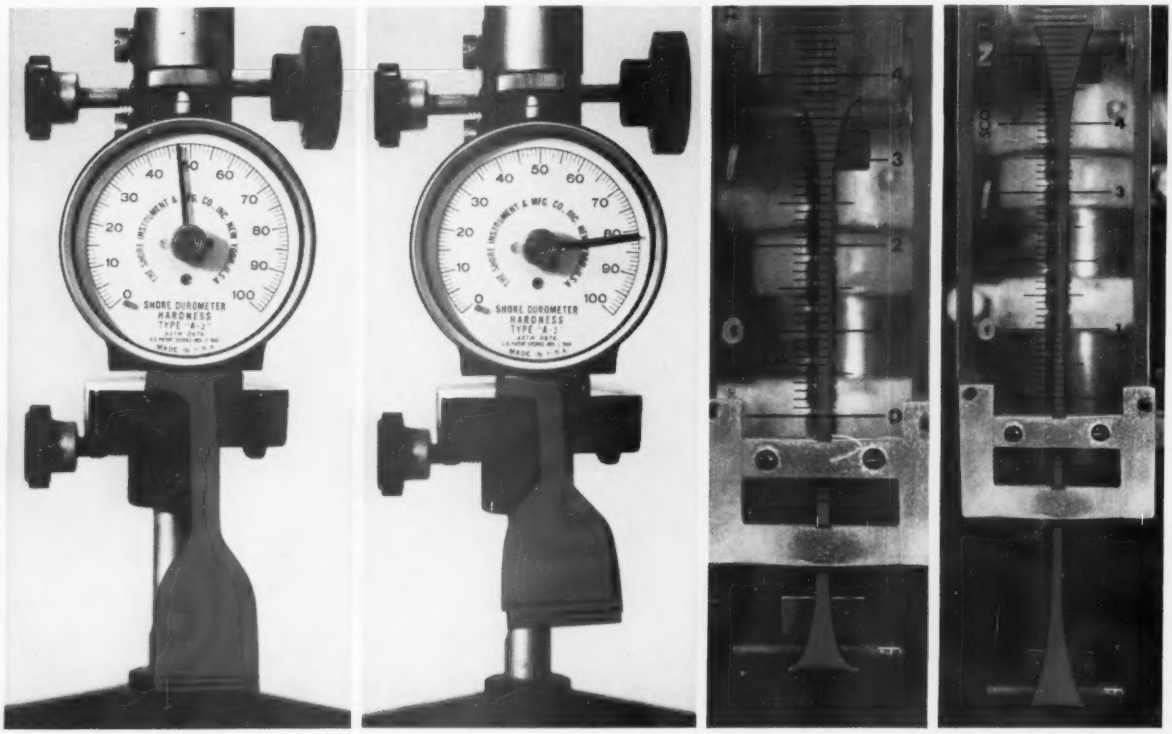
SILICONE NEWS from Dow Corning

Pick A Property; Compound It!



SILASTIC SILICONE RUBBER — Now Offered in Most Versatile Masterbatch

Newly introduced 433 Base, a masterbatch of Silastic®, the Dow Corning silicone rubber, allows you greater formulating freedom. With this one new base material you can compound for the exact properties you want in silicone rubber. Does one customer's product call for a 50 durometer rubber? . . . another an 80 durometer? . . . does one need high elongation? . . . another low elongation? You can make them all from the same masterbatch. In short, you can now match the properties that were formerly available only in pre-compounded commercial stocks.

Easy Processing. Silastic 433 Base is exceptionally easy to process, and has excellent green strength. Heat stability to over 500 F is built-in. There's no need for special additives. Silastic 433 Base has a shelf life of 6 months, and is readily available now. At right are some sample recipes and their typical properties. If you want to know more about recipes and procedures, just ask . . . Dow Corning has a library of information, plus extensive developmental facilities and technical service.

All this, and a simpler inventory, too!

Sample Recipes and Typical Properties

. . . For 50 Durometer Silastic	
Silastic 433 Base	100 parts
Cab-O-Sil MS-7	7 parts
Celite Super Floss	3 parts
Luperco CSF or Cadox TS-40	1.8 parts
* Durometer (Shore A)	50
Tensile strength, psi	800
Elongation, %	240
Tear Strength, lbs/in	60
. . . For 80 Durometer Silastic	
Silastic 433 Base	100 parts
Cab-O-Sil MS-7	28 parts
Luperco CSF or Cadox TS-40	1.8 parts
* Durometer (Shore A)	80
Tensile strength, psi	700
Elongation, %	150
Tear strength, lbs/in	85

* Vulcanized 5 min. at 240 F; cured 24 hours at 480 F.

Write Dept. 9224 for full details on new Silastic bases.

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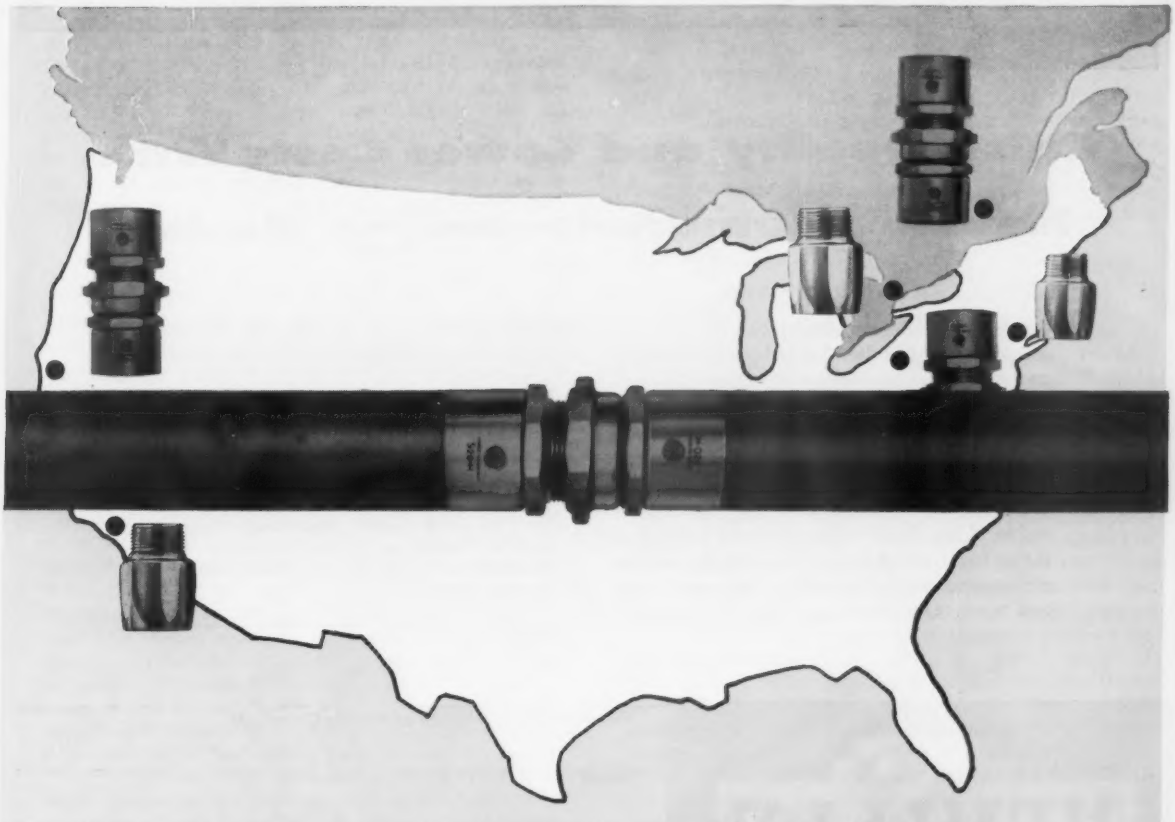
The largest—and finest—sales and service force in the industry is ready to consult with you anytime, anywhere when you specify Scovill couplings. And—because you can buy *direct* from Scovill—you save up to ⅓ the former cost of oil and gas pump couplings. Get complete details now. Write: Scovill Manufacturing Company, Hose Coupling Department, Waterbury 20, Connecticut.



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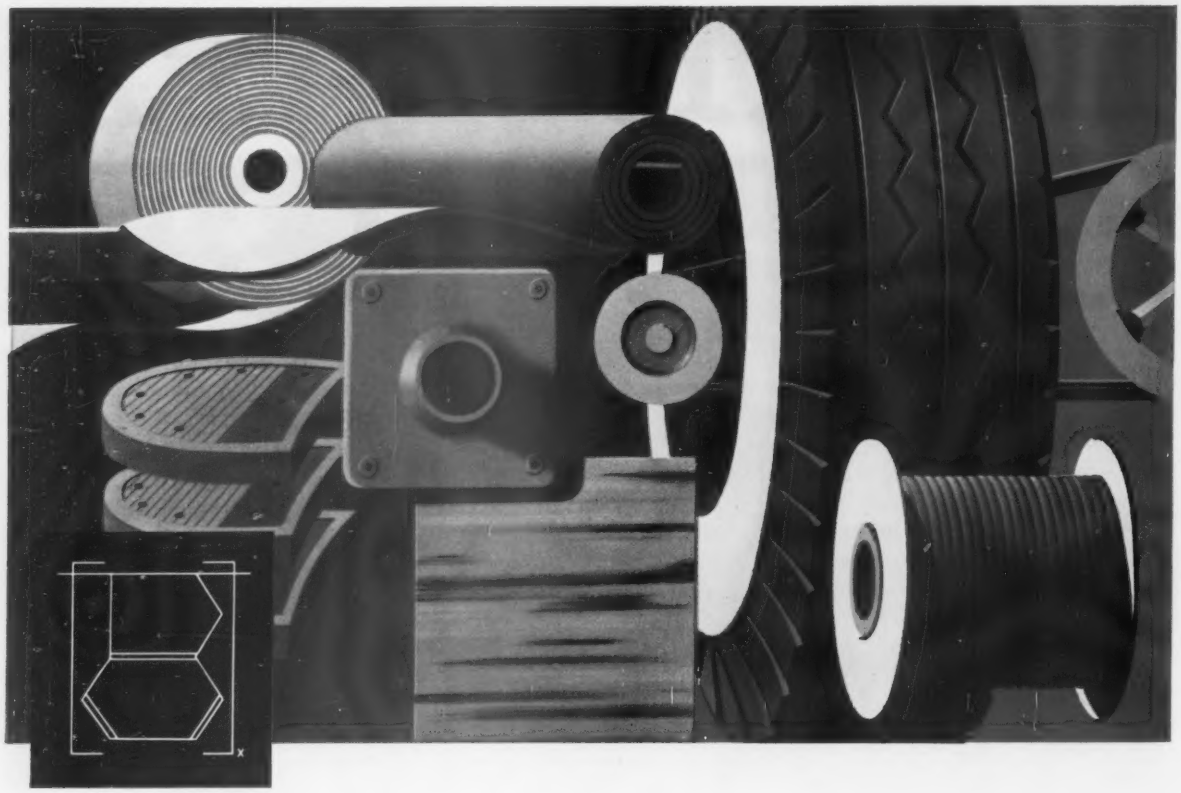

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As Soule Sees It...

by Kenneth J. Soule

The Banbury Mix-Up

As everyone in the rubber industry knows, the Banbury Mixer was invented by Mr. F. H. Banbury, and derives its name from him. It is also well recognized that the phrase, "Banbury Mixer," is a registered trademark, referring to the aforesaid internal mixer.

So far so good, but now, a British writer, the Honorable W. S. Penn, takes his pen in hand in the October 31, 1959, issue of *Rubber Journal* and *International Plastics* to publicly express his private worry about the murder of the King's English brought about when the proper name "Banbury" is confusingly used as the name for the mixer. In this connection, it may appear that our British friends are once more being super-fussy in the matter of semantics; but here at least, there seems to be some logic in their position.

If I understand Mr. Penn's contention correctly, he claims that since "Banbury" is a proper name, it is impossible to use the verb "to Banbury," or to employ the expression "Banburyed." Also, that it is shockingly incorrect to use the plural term Banburies, instead of the eminently accurate words, Banbury Mixers. While to describe the various sizes of these machines, we again must say No. 9 or No. 11, etc., Banbury Mixer, and not No. 9 or No. 11 Banbury.

Designate Banbury a Generic Term?

To bring order out of this linguistic chaos, the author of the above article suggests that Mr. Banbury and the Farrel-Birmingham Co. agree that the word Banbury (when applied to their mixers) become a generic name instead of a proper name, and subsequently, of course, be written with a small b: "banbury." By this simple change, it is claimed that all the present confusion and malfeasance will vanish. It will then be correct to have plural banburies, 3a, 9, 11, 27, or other numerically designated banburies, and a host of other word forms, such as the verb, "to banbury etc., etc., etc."

Far be it from me to hazard a guess as to whether or not the genial Mr. Banbury will be touched by the pain being suffered by his English compatriots and agree to the suggested change in the printing of his name, when applied to his world-famous mixer, from Capital B to small b.

It just might well be that Mr. B. and Co. will say in essence, "as long as the orders keep rolling in for our machines, we really don't worry much whether or not you spell the Banbury with a small, large, or medium sized B. Shakespeare may have soliloquized about to be or not to be, but as for us to B or not to b is merely of academic interest."

Blood and the Deep Freeze

At present, the maximum period for which whole blood is normally kept in a blood bank is about 21 days. Beyond this time, the hemoglobin quickly deteriorates and the blood becomes useless. Research, which is already well along at Linde Co. Tonawanda, N. Y. (a division of Union Carbide Co.) may shortly change this picture, and make it possible to store whole blood for years, or perhaps indefinitely, without significant loss of any vital characteristic. Such blood, as required, would be available for transfusion within a few minutes.

The new process involves the speedy freezing of the blood cells through the use of liquid nitrogen at —320°F. As Linde explains it, the 45-second freeze is sufficiently rapid to prevent the formation of large crystals which would damage the cell structure, while continued storage at this temperature prevents further physical or chemical change in the bood itself.

Historically, the development of the present method is tied up with the observations, the experiments, and the dreams of two widely separated scientists, a Roman Catholic priest and a practicing physician. The priest, the Rev. B. J. Luyet, formerly worked in the Biophysics Department at the St. Louis University. At present he is the head of a similar department at the American Foundation for Biological Research at Madison, Wisc. In his early work with whole blood, which began some thirty years ago, Dr. Luyet discovered that fast-freezing and thawing of blood cells could be accomplished without the formation of crystals, and therefore without damage to the cell structure.

Blood Preserved for Two Years

The other scientist, Dr. Max Strumia, director of pathology at Bryn Mawr (Penna.) Hospital, working independently, also found that he could preserve blood for as long as two years by quick freezing. His method involved the use of ether and dry ice. He also proved that if such frozen blood were thawed rapidly, it would be 95 per cent as good for transfusions as fresh blood.

Linde has already spent something like $500,000 of its own money in a moderately successful attempt to make the quick-freeze, quick-thaw blood method a practical matter on a mass production basis. The Office of Naval Research is apparently impressed with the prospects of ultimate success—at least it has granted Linde $350,000 to continue its engineering work on the problem. One important angle is the proper design of the container, since it would be highly desirable if the new blood could be collected, quick-frozen, stored, quick-thawed and finally transfused from a single sterile receptacle.

As soon as the final details of the commercial process are worked out, it is expected that massive amounts of stock-piled blood will be instantly available for any great emergency. It is also considered possible that a variety of other materials may be preserved indefinitely for future study. These might include human tissue, cancer cells, germs, viruses, bone marrow, or what-have-you. The potentialities almost stagger the imagination!

As Soule Sees It (Cont'd)

Dark of the Moon

Scientific aspects of the amazing exploits of the Soviet Union in photographing the far side of the moon, and transmitting these photos some 25,000 miles back to earth have been well covered in all manner of publications, both here and abroad.

However, Donald I. Rogers, business and financial editor of the *New York Herald Tribune*, is of the opinion that business men in general are missing one extremely important aspect of the Russian moon shots. Instead of taking an "interesting, but so what," attitude toward the Soviet accomplishment, Mr. Rogers feels that American businessmen should be viewing the stunt as a serious and deadly threat to the United States economy, and should be putting their collective heads together to devise ways and means of combatting the potential menace to our business institutions.

Technical Difficulties Overcome

Not that the re-transmission of moon pictures in itself is anything to worry about, except as an indication of the Soviet ability to overcome enormous technical difficulties not only in space technology, but also in consumer goods of any and all kinds if and when they decide to do so. As the *Tribune* economist sees it, Mr. Khrushchev was not fooling when he said that his country would bury us in the economic struggle rather than from a military stand point. To prove his contention, Mr. Rogers points out that machine-tool production in Russia has increased at an enormous rate in the last few years, which is an ominous sign, since all consumer goods are based on machine tools themselves. In addition, he notes that Russian factories, being government owned, can operate at a loss and sell their products abroad below cost any time the leaders decide to start cut-throat competition with any country in the world (especially the United States) and with almost any type of consumer goods Russian leaders choose.

It may well be that Mr. Rogers is unduly concerned about the menace of this type of Soviet competition. However, since he is not an alarmist, and since a great deal of the evidence which he cites is almost irrefutable, it would seem that American business men might do well to consider his warning seriously. And although no specific mention as such is made of union leaders, we would believe that the warning should apply, as well, to them and their organizations. For unless management and labor find some way soon to make American industry cooperatively competitive with *normal* foreign competition, we will surely be an easy target for the type of Russian rivalry Mr. Rogers fears.

Civil Defense Re-Activated

In peace time, or perhaps it would be more accurate to say, between wars, civilian defense planning customarily has tough siedding. This is partly because people at large dislike to be reminded of unpleasant matters, and partly because it is hard to dramatize or adequately explain simply and convincingly the varied facets of total civil defense.

The latest entry into the field of those attempting to help out in these matters is the American Chemical Society, through the medium of a committee appointed for the purpose. At the request of the Federal Civil Defense Administration (FCDA), this committee has been meeting with the FCDA, and more recently with its successor, the Office of Civil and Defense Mobilization (OCDM). It appears that the three most important subjects discussed were: (1) Biological Warfare (BW) (2) Chemical Warfare, (CW) and (3) Radiological Warfare (RW), particularly methods of rapid detection of the agents involved in such warfare, and adequate means of protecting against them.

The general public is conversant to some degree with RW, at least to the extent of recognizing the possible danger of radioactive fallout following an atomic bomb attack. The question of protection against such radioactivity has received much publicity, and is still being studied by government experts (as well as by numerous well-meaning amateurs).

CW and BW Not Understood

However, in the matter of Chemical and Biological Warfare, the general public is almost completely ignorant of the basic problems involved, both as to the critical nature of possible hazards, and the lack of adequate methods of detection, and of personnel protection. Probably the chief reason for this widespread lack of information is that previously imposed high-level security regulations placed the bulk of the data available under a tightly classified security basis.

It appears that these needlessly severe security regulations are now being eased, so that more and better information will be forthcoming for the general public. Also, that as a result of the splendid cooperation between the ACS and the OCDM, a number of vitally important facets of BW and CW will receive accelerated and intensive study. These would include the detection and very speedy identification of the agents used (or which might be used); the rapid development of a simple and effective mask which would protect against all volatile CW, BW and RW agents. (It would be planned to manufacture such a mask in quantity and at a low price so that it could be mass produced and readily available throughout the country.)

Publicity to be Accelerated

If the momentum generated by the ACS-OCDM meetings continues, we shall be hearing more and more about the various aspects of these unpleasant subjects—Chemical, Biological and Radiological Warfare, and how the country can be defended against them.

This is all to the good, since the more wide spread such knowledge becomes and the better our armed forces are equipped to launch effective retaliatory attacks, if necessary, the less likely the need will be for such reprisals. As Ben Franklin (or was it Socrates) used to say, "Forewarned is forearmed."

To Everyone . . . Everywhere

Season's Greetings

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How NS solved another bead wire problem

NEW PACKAGE inside steel "steam box" completely protected bead wire from rust during six week test.

VACUUM SEALING of new polyethylene bag keeps bead wire safe from corrosive atmospheres. After sealing, cardboard outer wrapper is added for additional protection before palletizing.

NEW NATIONAL-STANDARD PACKAGE PREVENTS CORROSION

A new bead wire packaging development from National-Standard permits storage of bead wire indefinitely without danger of rust or corrosion.

Now National-Standard is shipping bead wire in a vacuum-sealed polyethylene bag with a cardboard outer-wrapper to protect against scuffing and tearing. The polyethylene pack was made possible by National-Standard's development of reel-less coil packaging over six years ago.

EXTENSIVE TESTING of the new package over a period of many months has proved the new polyethylene package's superiority over old-style wrappers. National-Standard research engineers placed a new vacuum package, together with an old-style package, in the highly humid environment of a paper mill for several weeks. At the end of the test period, bead wire in the old package showed extensive rust. But wire inside the polyethylene bag was in excellent condition.

For additional proof, National-Standard put the new package through a torture test. For *six weeks*, new vacuum bag (wrapped with cardboard outer package) withstood extremely high humidity inside a steel steam cabinet *without any evidence of wire corrosion*.

NEW PACKAGING TECHNIQUE is a five step process: (1) polyethylene bag is placed over two bead wire coils; (2) a desiccant is placed inside bag; (3) bag is vacuum-sealed; (4) protective cardboard wrapper is placed around packaged coils; (5) entire unit is steel-strapped to pallet.

ANOTHER NATIONAL-STANDARD FIRST in the field of bead wire development, the new vacuum package becomes a significant addition to the long list of National-Standard contributions to the rubber industry. For over fifty years, National-Standard has been the leader in bead wire research and development. Whenever you have a *wire-in-rubber* problem, let National-Standard put this experience to work for you. For additional information, write National-Standard Company, Niles, Michigan.

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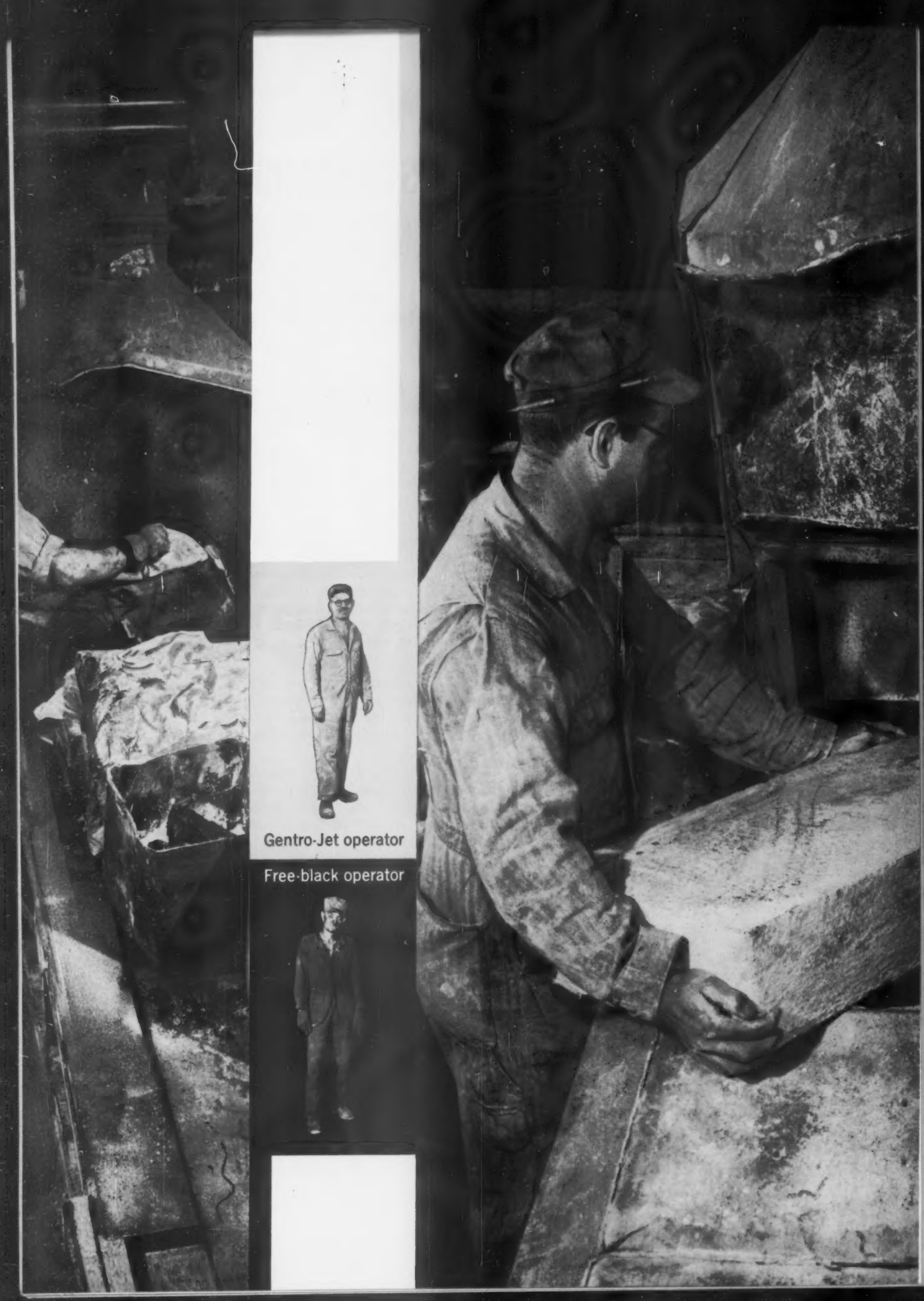
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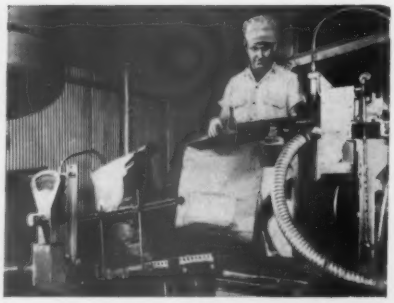

When carbon blacks leave Witco-Continental plants, you can be sure they're in good condition. We photograph each shipment after loading as a check on correct and damage-free stacking. These photographs, with specially designed loading diagrams attached, are then sent to you as *your* check on shipping conditions.

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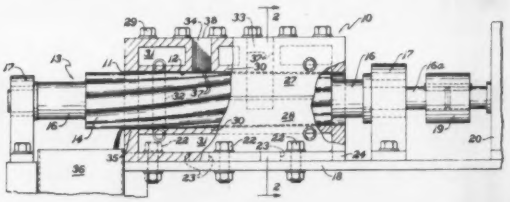
PATENT REVIEW

by Melvin Nord

Mixing Rubber

U. S. Patent 2,894,280, issued July 14, 1959 to Arthur E. Juve, assigned to the B. F. Goodrich Co., describes apparatus for mixing, blending, and plasticizing rubber and other plasticizable materials in a single piece of equipment. The apparatus is characterized by a rotor having longitudinal ribs which rotate inside a passage extending through a stator.

The improved mixing action, as well as the mastication essential to efficient mixing of rubber and pigments, is obtained by the cooperation of the face of the ribs presented to the rubber and the surface of the passage through the



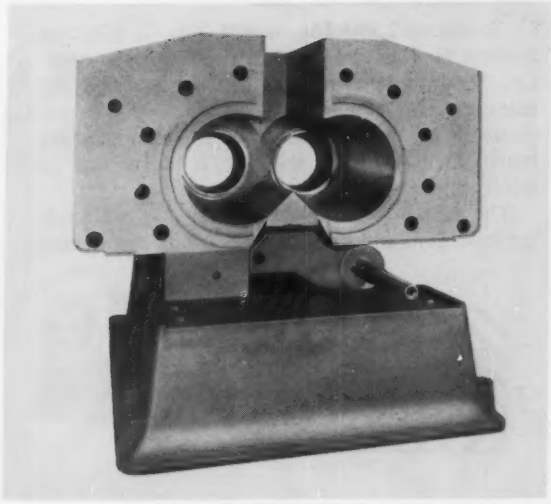
stator surrounding the rotor against which the rubber is mulled and worked by the ribs. As the rotor rotates inside the stator, the face of each rib leading the rib in the direction of rotation is shaped to forcibly smear the ingredients of the mixture together against the walls of the stator and simultaneously stretch the mixture both circumferentially and lengthwise to the rotor. The power requirements do not exceed that required for mixing comparable quantities of rubber on open mills and are considerably less than that required for Banbury mixing. Further, the temperature of the mixture can be accurately regulated with this equipment, as can the rate at which the mixing is accomplished so that it may correspond to the operation of any particular subsequent processing equipment to which the mixture is to be delivered.

Antiozonant Material

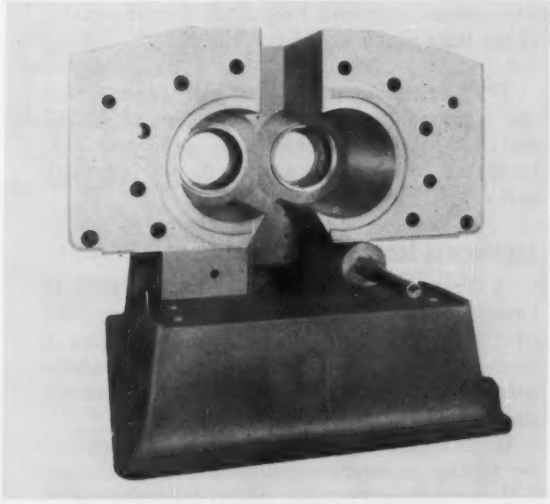
U. S. Patent 2,867,604, issued January 6, 1959 to Robert H. Rosenwald and Joseph A. Chenicek, assigned to Universal Oil Products Co., describes a method of preventing the cracking of rubber due to ozone.

The method consists of incorporating in rubber 1 to 5% by weight of N,N^1-di-sec-octyl-p-phenylene diamine.

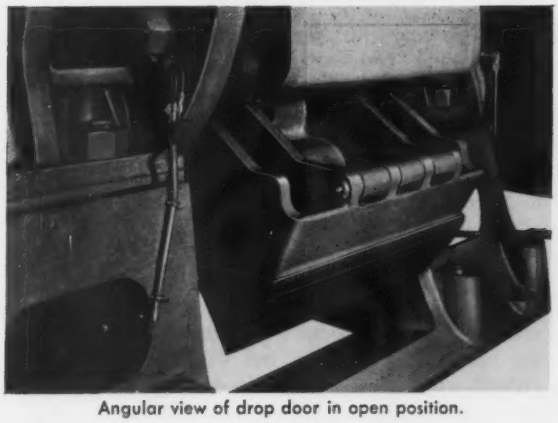
NEW BANBURY® DROP DOOR DELIVERS 3 BIG BENEFITS



Chamber of Banbury with drop door in closed position.



Drop door partially opened.



Angular view of drop door in open position.

- *leakage prevention*
- *shorter cycles*
- *almost instantaneous discharge*

Here's a new development in Banbury mixer design: the hydraulically operated drop door...now available as an optional feature on all new production-size machines.

The drop-door design does away with a source of leakage and contamination which cannot be avoided in sliding-door design. Clearances which permit some leakage are required for sliding action which is not the case with the drop door. The new door is hinged, and the surfaces of the door edge and the bottom of the mixing chamber are tapered so that a good line of contact is obtained. The door is leakproof throughout a full period of normal wear and there are no tailings left to contaminate a succeeding batch.

The new door has been clocked as low as eight seconds for opening, discharge and closing—more than twice as fast as a sliding door. As a result, the over-all mixing cycle is reduced. And, in short-cycle operation, discharge time is in better balance with actual mixing time.

Faster discharge, besides cutting cycle time, is particularly advantageous when formulas require almost instantaneous discharge after predetermined temperature is reached. With some, a few seconds lag will permit the stock to setup in the mixing chamber.

Write now for Bulletin No. 207 on Banbury Mixers. It includes details on this important development.

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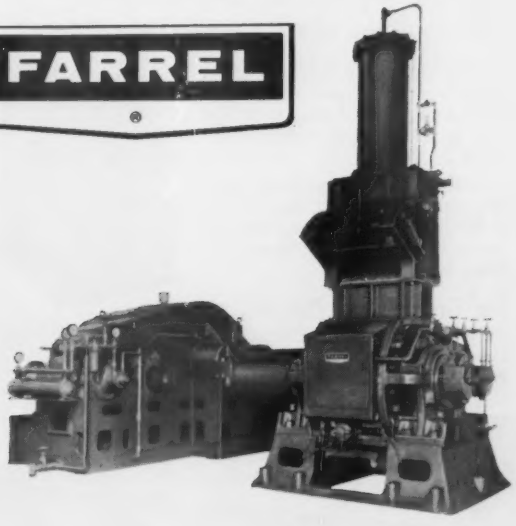

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Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

Input speeds range from 10 to 125 feet per min. depending on material and size of cube desired.

The CUMBERLAND Rotary Chopping and Dicing Machine

As a chopper, this machine efficiently cuts rubber and vinyl slabs into small pieces. Two sizes available to handle stock widths up to 14 or 24 inches.

As a dicer in modified form, handles principally vinyl sheet stock. A less expensive machine though less universal than the "Stair-Step" Dicer shown above.

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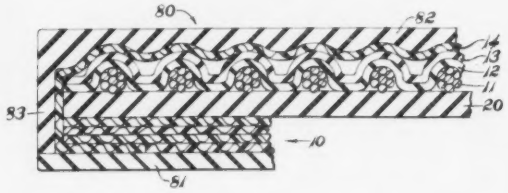
PATENT REVIEW

Cable Reinforced Conveyor Belts

U. S. Patent 2,893,466, issued July 7, 1959 to Herbert H. Fink, assigned to the B. F. Goodrich Co., describes a process and apparatus for manufacturing conveyor belts of elastomeric materials, with stranded steel cables extending longitudinally through the carcass of the belt as reinforcement.

The cables are enclosed between the surrounding base gum and tie gum while being maintained



free from any substantial squeezing pressure in a direction laterally or radially of the cables. This avoids wave-like irregularities in the center of the belts which would prevent them from lying flat.

The illustration shows the belt carcass with the outer rubber cover 80, tie gum layers 12 and 13, rubber-covered fabric ply stock 14, laminated base carcass stock 10, base gum 20, and cables 11.

Agglomerated Accelerators

U. S. Patent 2,888,443, issued May 26, 1959 to Donald W. Hayes and Harold P. Roberts, assigned to Goodyear Tire & Rubber Co., provides a method for the production of powdered accelerators in an agglomerated form which eliminates dusting.

It has been found that this can be accomplished by mixing an aqueous slurry of the accelerator with a small amount of a rubber latex containing an antioxidant and an acid-stable synthetic emulsifier, coagulating the latex after it has been thoroughly blended with the accelerator, removing the excess water, forming agglomerates and drying the agglomerates.

Tire Casing with Anti-Skid Device

U. S. Patent 2,888,057, issued May 26, 1959 to Vernon H. Hildebrandt, relates to the casing of pneumatic tires having an integral anti-skid or traction increasing device associated with it. The tire casing is provided with outwardly projecting spike-like elements which are normally located above and out of contact with the ground when the tire is fully inflated, but which contact the ground when the tire is partly deflated.

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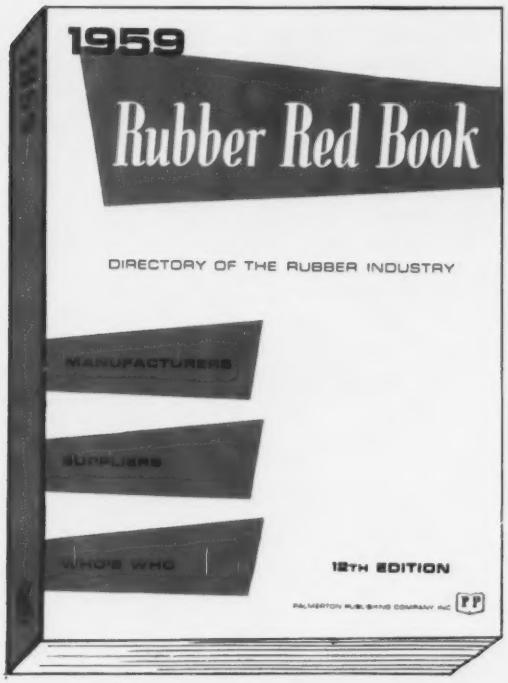

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PATENT REVIEW

Vulcanizing Furnace Black Stocks

U. S. Patent 2,892,805, issued June 30, 1959 to Andrew Tomlin, Marion W. Harman, Richard O. Zerbe, and Robert L. Sibley, assigned to Monsanto Chemical Co., describes a process for vulcanizing a rubber stock containing a furnace black, in which prevulcanization or scorch is eliminated.

It has been found that the use of certain N,N′-dithio-bis-secondary amines as the essential vulcanizing agent, in conjunction with delayed action thiazole accelerators (preferably thiazolesulfenamides), provides an adequate margin of processing safety. Flex cracking can be prevented by treating the compound with certain antidegradation agents (e.g., 6-methoxy-1,2-dihydro-2,2,4-trimethylquinoline).

Other Patents of Interest

Subject	Inventor or Assignee	Patent No.	Date
Production of flexible cellular polyurethane material	Goodyear Tire & Rubber Co.	2,888,408-9 & 2,888,411-3	5/26/59
Pelletizing dry rubber accelerators	Goodyear Tire & Rubber Co.	2,888,444	5/26/59
Weather resistant white composition rubber	Esso Research & Engineering Co.	2,889,307	6/2/59
Vulcanizer	Russell K. Hedge	2,889,579	6/9/59
Tubeless tire bead seating device	United States Rubber Co.	2,889,870	6/9/59
Siloxane elastomers compounded with hydroxylated silanes	Dow Corning Corp.	2,890,188	6/9/59
Manufacture of finely porous butadiene-styrene copolymers	Rhein-Chemie GmbH	2,891,016	6/16/59
Preparation of flame-retardant silicone rubber	General Electric Co.	2,891,033	6/16/59

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D.C., for 25 cents each. Do not send stamps.

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• Yugoslavia now manufactures tractors (Type Zadrugar and Massey-Ferguson), and the Yugoslavian rubber factory, Rekord in Rakovica near Belgrade, plans to start manufacturing tractor tires. That country has been importing these tires from England, Italy and West Germany. Machinery to manufacture tractor tires will be purchased from Czechoslovakia and West Germany.

• The Indian Industrialist, Tulsidas Kilachand, has joined Firestone Tire & Rubber Co. in Akron, Ohio, in the construction of a factory for synthetic rubber in India. The new plant, to be located in Central India in Bareilly, will have a capacity of 30,000 tons a year and will cost approximately $30 million. At present, India consumes about 45,000 tons of rubber a year and is expected to utilize 60,000 tons in 1961. Firestone is supposed to contribute $6 million toward the cost of the new factory. Mr. Kilachand will invest $15 million, and the balance will be subscribed by American and English banks.

• Several German trade publications contain summaries of their feature articles translated into English and French. As a result, many overseas readers subscribe to these publications. The English trade press is following this example and one of the leading English trade publications in the plastics line has initiated a new column called "International Digest", which contains translated summaries of principal articles appearing in each issue.

"International Digest" offers, in German and French, detailed summaries which are not merely brief abstracts but comprehensive digests of important technical papers. This will permit readers abroad to grasp the salient points in the articles of each issue and, in addition, to decide which articles they would like to have translated in full. The effectiveness of international circulation of this paper is thereby increased.

Its growth in circulation in recent years has been due largely to expansion within the plastics industry and the ever-widening spread of plastics applications. Every industry now employs these materials in one form or another. However, there has been a special increase in the circulation of this trade paper and more than 50 per cent of its subscribers are located outside of the United Kingdom. Reasons for this are threefold.

First, plastics technology in Great Britain is of a very high order. The world has evinced a growing desire to follow these developments in detail. It has been the purpose of this publication to report new developments with emphasis on technology, whether in the manufacture of materials, testing or methods of fabrication. Second, this paper gives special coverage to plastics machinery, as may be seen in the "Machines for the Industry" series. Finally, it has been the policy of this journal to report the progress of plastics abroad including reviews of trade fairs, technical contributions of overseas authors and surveys of economic and technical developments.

This policy has been further reinforced by the establishment of the European Common Market and the associated trade areas, which focused attention on the need for a journal of wider than national coverage. From these developments, it was a logical step to initiate the "International Digest" as a regular feature in the journal. Its influence will be a force for good in plastics industries everywhere.

• A patent has been granted to the Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik, G. m. b. H. (Germany), according to which lacquers (films) of remarkable brightness, hardness and elasticity can be prepared by esterifying tri- and polybasic benzene carboxylic acids with polyhydric alcohols (butylene glycol). Premature hardening, however, occurs and leads to losses. This gelatinization can be avoided, yielding excellent, highly cross-linked resins, by first completely esterifying the tri- and polybasic benzene carboxylic acids with monohydric alcohols. Another method is to partially esterify the acids and subsequently replace the monohydric alcohol and eventually, the liberated water.

• At a convention of all sections of the plastics industry and trade in India, a number of resolutions were proposed which indicate India's need for plants and machinery. One of the resolutions states "The convention draws the attention of the government of India to the plight of the plastics industry due to the wearing out of most of its plants and machinery, the bulk of which was imported almost a decade ago, and as the Indian plastics machine and mould making industry produces very crude and rudimentary types of equipment, this convention recommends that import of new machines should be liberally allowed for replacement purposes." There is obviously an important market in India for our

On the Continent (cont'd)

machinery and it is hoped that the Indian Plastics Federation can bring sufficient pressure to bear on its government to ease the restrictions which, at present, hamper the growth of that country's industry.

• An announcement recently made by the British Packaging Films Manufacturers Association states "The ever increasing use of plastics is introducing to the public many new names for different materials. It is doubtful whether many people are yet able to distinguish between the properties of the various plastics which are now on the market and it would seem foolish to foster confusion by the use of two names for the same product. This is, however, happening as the names 'Polythene' and 'Polyethylene' are both in general use.

"The term 'Polyethylene' was apparently evolved in America under a mistaken impression that the name 'Polythene' was a registered trade name in the United Kingdom. It is felt to be high time this error was corrected and the polythene film manufacturing members of this Association, which represents all of the principal makers, have agreed that they will use exclusively the name 'Polythene'. It is hoped that all who have interests in the manufacture and sale of polythene products will follow the same course and so help to avoid any risk of confusion in the mind of the public."

• International Congress, 1960, on the Technology of Plastics Processing will be held in Amsterdam from October 10 to 12, 1960, under the sponsorship of the Association for the Advancement of the Knowledge of Materials, the English Royal Institute of Engineers and the Royal Netherlands Chemical Federation. The congress is being held prior to the 2nd International Plastics Exhibition "macro-Plastic", October 12 to 19, 1960.

• A method of forming a flexible tube is dealt with in a patent granted to Compoflex Co., Ltd., England. A seamless tube of polyvinyl chloride, for example, is sealed at one end and expanded by pressure within a guide tube. An axially expanded wire helix is moved into the laterally expanded tube. The pressure is then decreased so that the plastic tube contracts onto the expanded helix which also contracts so that the seamless tube folds over the turns of the helix.

• The first Soviet all-plastic river steamboat, described as a "freighter" with a displacement of 15 tons, has been launched near Moscow. Built by a small firm, the Moscow Shipping Line, it has a hull of 48 feet and a 60 horsepower engine.

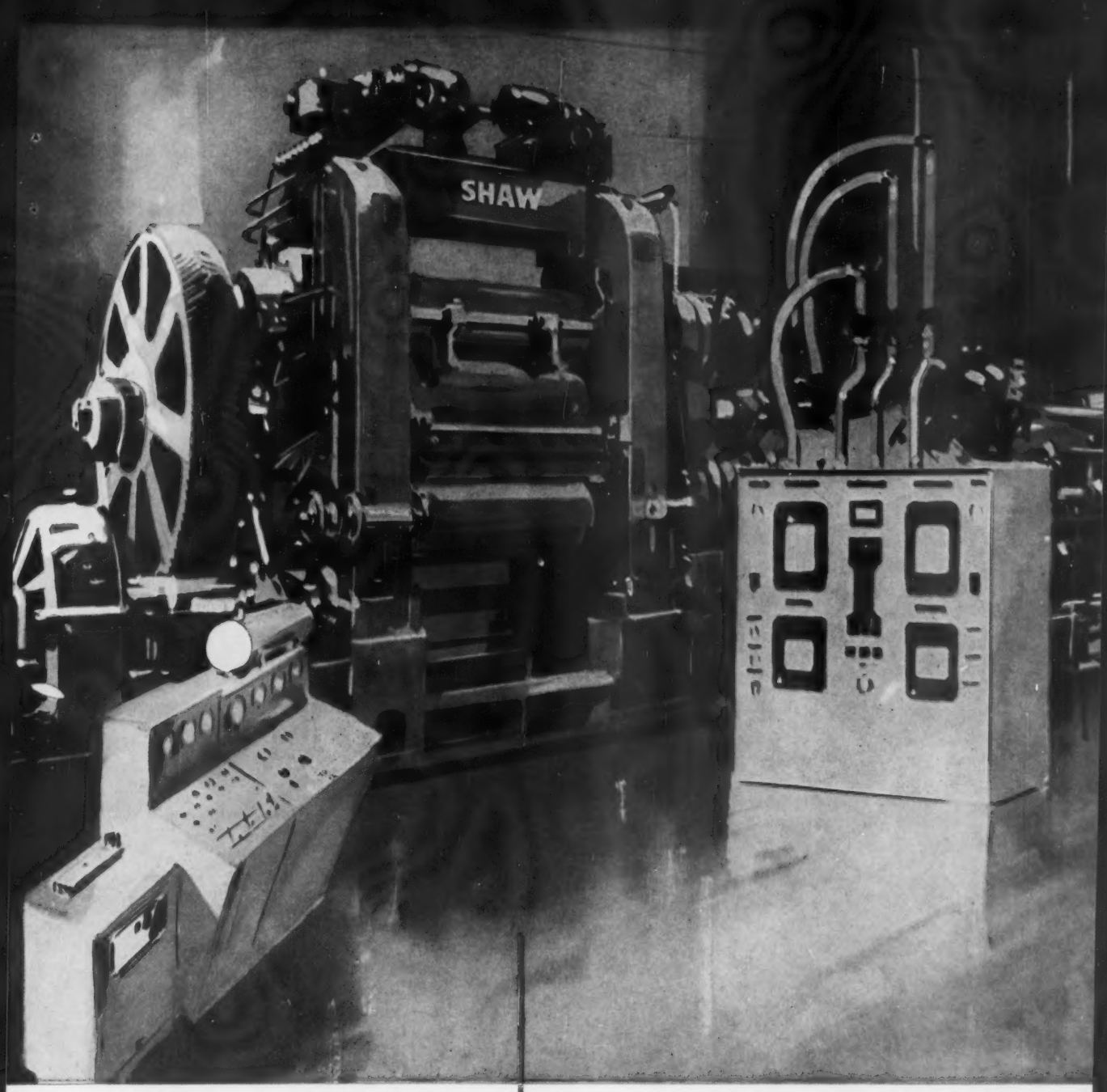
• Farbenfabriken Bayer, A. G. (Germany), has been granted a patent for a mixing apparatus and process for producing polyurethane plastics. The apparatus consists of a mixing chamber with a stirring device to which two or more reaction components can be supplied by pumps. A piston ejection cylinder is connected to the chamber and provided with an injection device for an additional reaction component arranged at the lower end of the cylinder with a discharge pipe and a reservoir of cleansing liquid.

• Skanska Attikfabriken AB of Perstorp has recently begun full-scale production of the Vinamul and Vinalak ranges of synthetic resin emulsions and solutions. Skanska Attikfabriken AB is associated in this venture with Vinyl Products, Ltd., of Carshalton. The firm hopes to satisfy Swedish demand for this type of product, which has hitherto been met by imported materials.

• Bonding of fabrics to a surface or coating of polyvinyl chloride can be accomplished, according to a patent granted to Fothergill & Harvey (research and development) Ltd., Vinyl Products Ltd., by impregnating a fabric with a bonding agent in the form of a dispersion of a mixture of a plasticized polyvinyl chloride, an epoxy resin and a hardener for the epoxy resin in an organic medium (e.g. acetone). After drying and curing, the fabric is finally coated with polyvinyl chloride. Suitable fabrics are those manufactured from glass fibers, asbestos fibers, nylon and Orlon.

• Lists of goods to be exchanged under the agreement between the Benelux countries and Czechoslovakia in the year starting April 1, 1959, have now been published in Belgium. Included in imported Czechoslovakian products into the Benelux countries are: pneumatic mattresses, 15,000 units; rubber footwear, 375,000 pairs; and a sizable amount of asbestos cement products. Exported products from the Benelux countries to Czechoslovakia include synthetic resins, 100 tons; sundry rubber articles including driving belts, 120 tons; and tires of all sorts, 1,000 tons.

It is interesting to note that about 150 miles from Czechoslovakia near Vienna, Austria, there is a factory which can turn out a great number of tires of all sorts. Yet in order to satisfy the whims of totalitarian trade channels, those tires will have to be imported from Belgium, traveling many, many hundreds of miles to reach Czechoslovakia.



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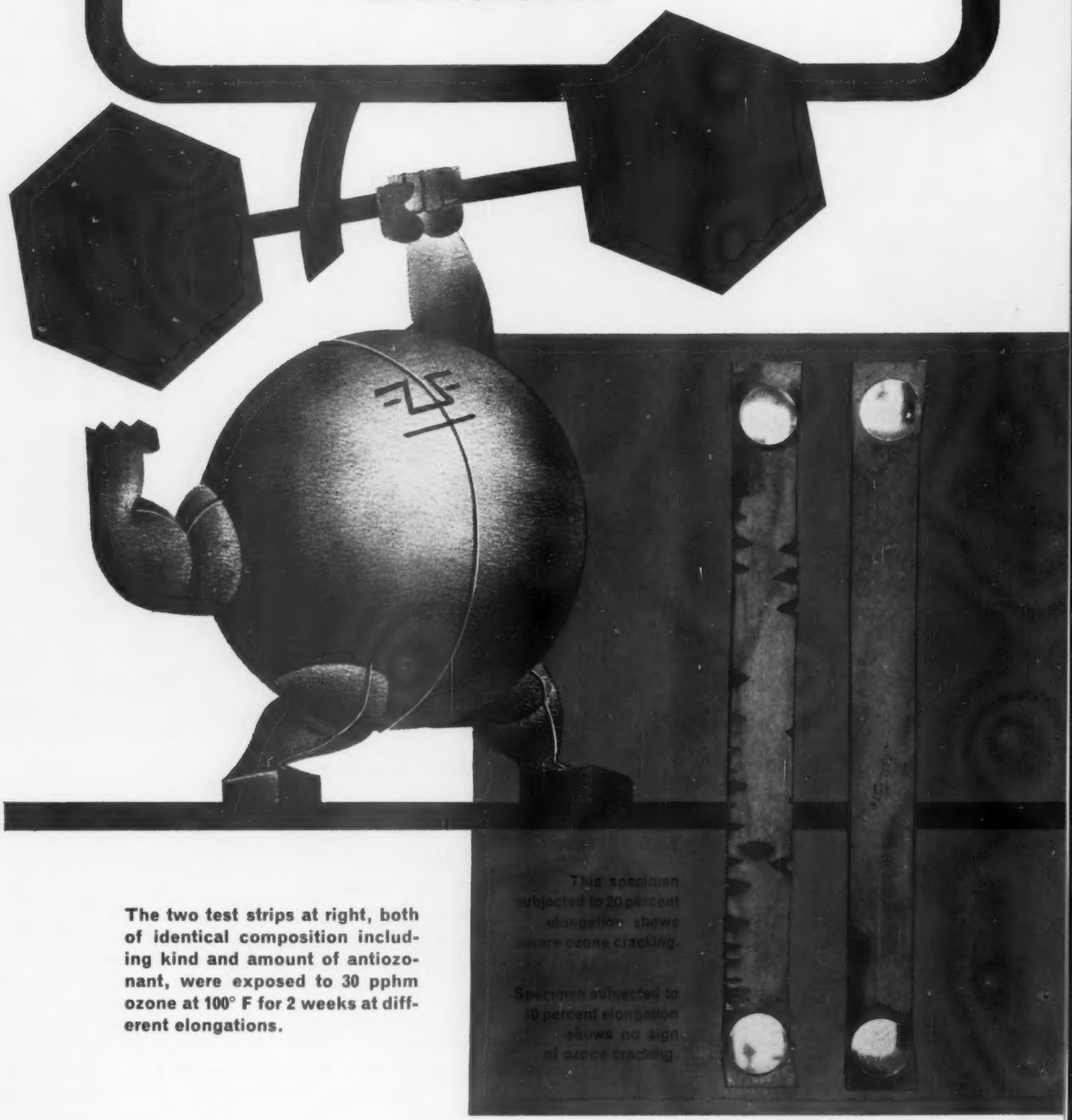
OVERSEAS AGENTS THROUGHOUT THE WORLD

how can rubber under STRESS fight off ozone attack?


This specimen subjected to 20 percent elongation shows severe ozone cracking.
Specimen subjected to 10 percent elongation shows no sign of ozone cracking.

The two test strips at right, both of identical composition including kind and amount of antiozonant, were exposed to 30 pphm ozone at 100° F for 2 weeks at different elongations.

properly formulated, rubber can withstand ozone, even under severe dynamic service . . .

What happens to a well formulated rubber compound when the vulcanized product is subjected to inherent or applied stresses?

The photos of test strips below give a graphic answer: Ozone attacks the surface of the product and severe cracks develop.

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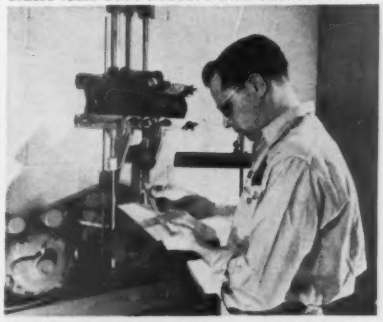
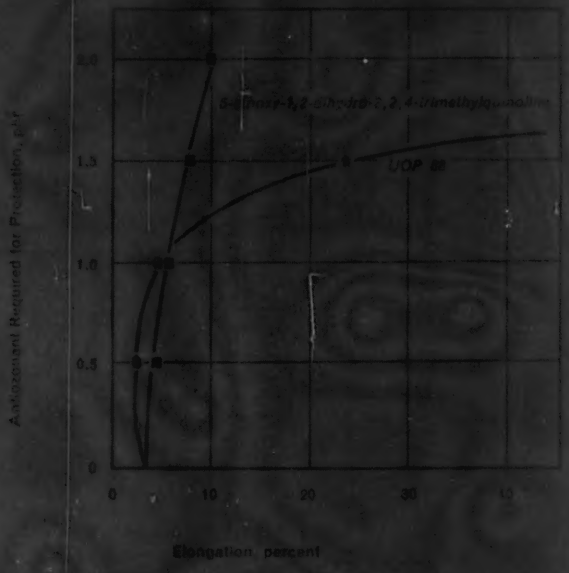


DeMattia flexer is used to evaluate flex-cracking properties of compounds tested in UOP rubber laboratory.

UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.

Test specimens mounted on outdoor racks are examined at regular intervals for evidence of deterioration.



Curves plotted for UOP 88 and a competitive antiozonant show that while antiozonant requirement increases with increased strain, it does so at a far lower rate for UOP 88 than for the competitive material.

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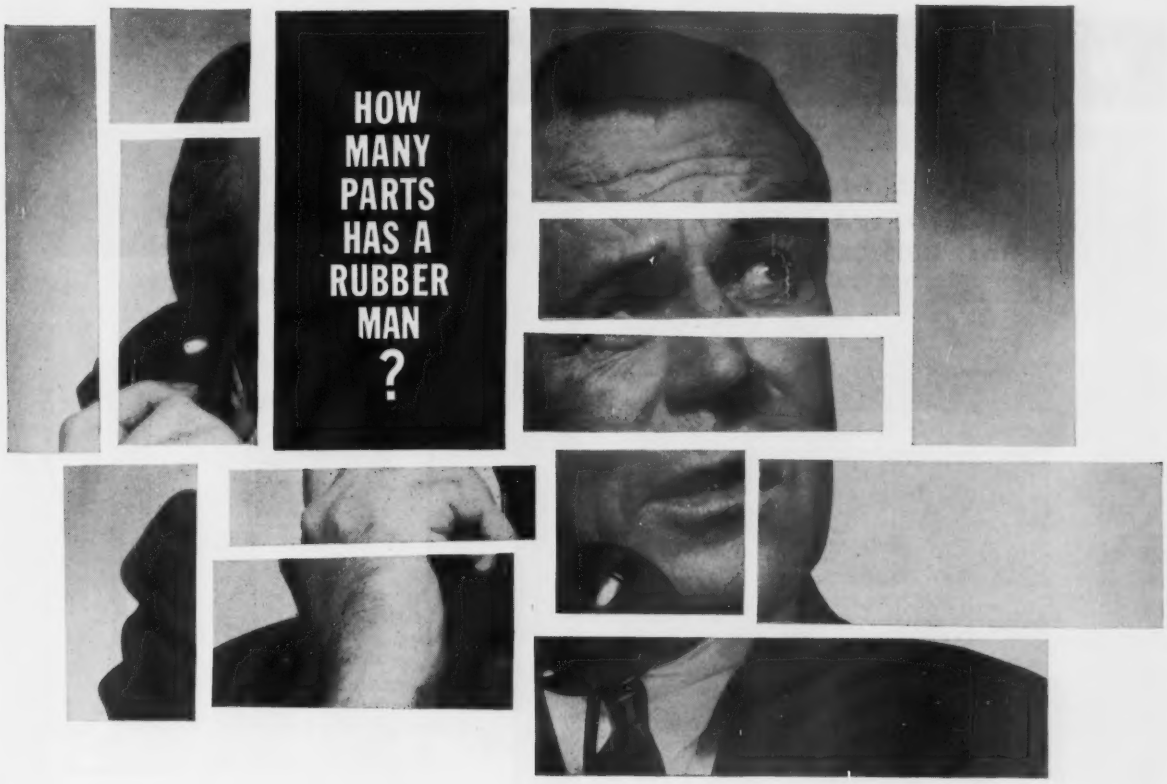

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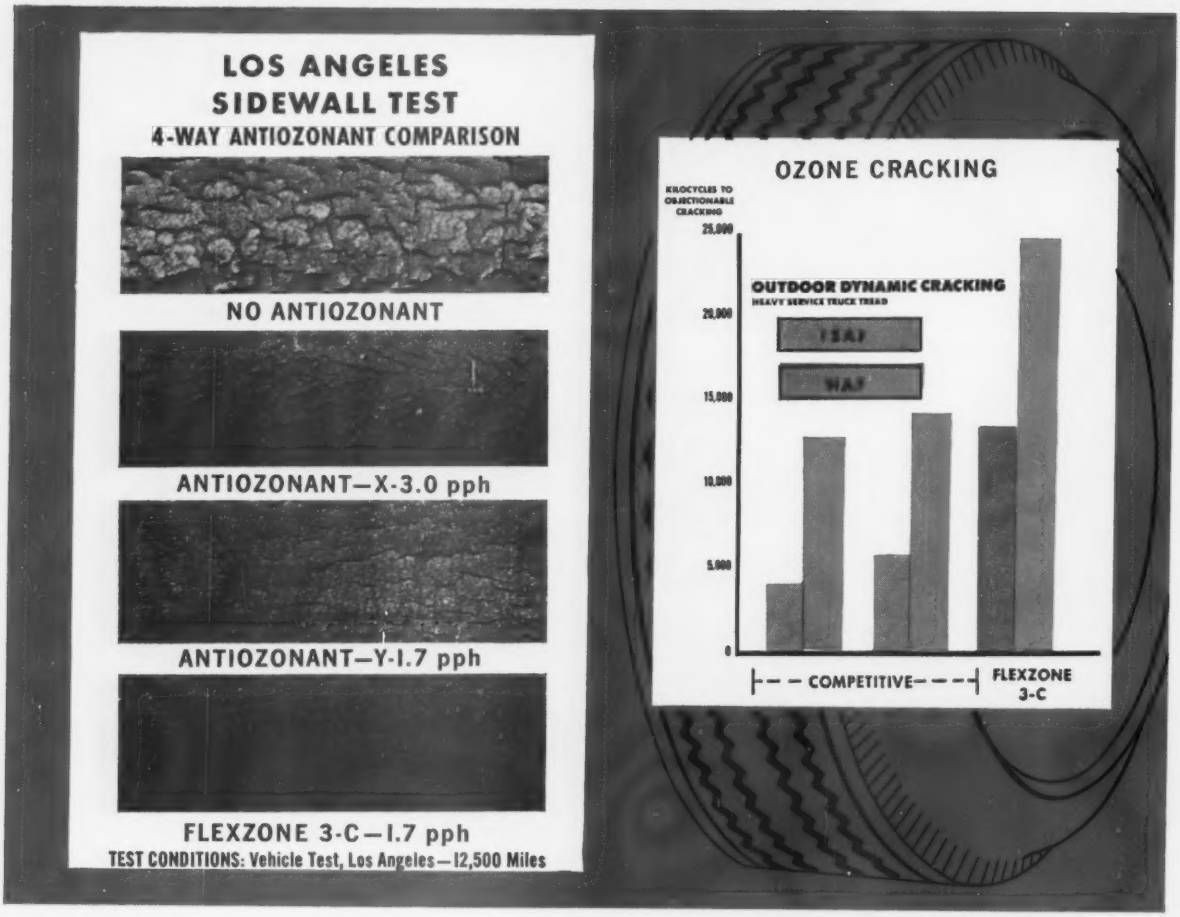

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Participants in the symposium include (left to right): moderator B. Kastein of the Firestone Tire & Rubber Co., speakers T. M. Kersker, K. R. Garvick and K. L. Campbell.

Today's Tires

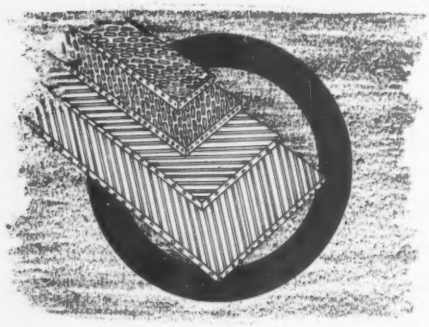
A SYMPOSIUM

- **Textiles**
- **Design**
- **Compounding**

ON October 23, 1959, the Akron Rubber Group held a symposium on "Today's Tires" at the Sheraton Hotel in Akron, Ohio. Three speakers, all specialists in their field, described how a modern tire is designed, what materials are used and why such a tire has adequate performance. Because of the wide interest generated by the symposium, RUBBER AGE is publishing the three addresses herewith.

The speakers presented their answers to a number of questions of immediate import to the tire industry. Will the new 13-inch tire deliver as much wear as the present 14-inch model? Will there be greater tendency to radial crack or tread separation? Will traction be a problem? What changes in design or construction are necessary to make a satisfactory tire for the new lower priced American cars? Are compound changes needed and how are they made?

Passenger tires are not the only ones meeting new and demanding service requirements. Off-the-road tires of yesteryear with top speeds of 10 mph are now doing 40 mph with the same load. Heat failures due to high speeds are also a problem for truck tires traveling down highways at 70 mph. These are some of the issues facing the engineers and compounders of "Today's Tires," discussed in the following pages.



TEXTILES
in Today's Tires

By T. M. KERSKER

Goodyear Tire & Rubber Co., Akron, Ohio

WHEN the word "tire" is mentioned, most people think only of rubber. However, it is the cord hidden within rubber that holds the tire together and gives it shape and strength.

It was about 1905 when the first pneumatic tires were made using square-woven cotton fabric. At best these tires ran 1500 miles, but more often failed at 100 miles. One of the big advances in tire development occurred when cotton cord replaced the square-woven cotton fabric.

In 1934, rayon, a new tire cord material, appeared on the scene. It was man-made by regeneration of cellulose. Rayon had better strength. During the latter part of the Second World War the armed forces developed larger and more powerful bombers. Nylon, because of its lightness and strength, was used to resist the impact during landings.

Almost any boy would recognize tire cord as a sort of kite string. When you are driving too fast, it is well to remember that all the horsepower and brake forces are transmitted through that cord. As one of my friends put it, "You literally bet your life on the ability of people to make good kite string."

Cord as a Component

At Goodyear, we like to think of the cord or fabric as one leg of a three-legged stool, the others being rubber compound and tire design. Proper emphasis and responsibility must be assigned to each leg to keep the stool level and enable it to bear whatever load is necessary. The cord provides the tire with shape, size stability, bruise resistance, fatigue resistance and load carrying capacity. In addition, the fabric has a profound effect on ride, noise, hysteresis, separation, high speed performance and durability.

It is not surprising that the tire fabric is the most costly part of the tire. This year more than $400 million worth of tire fabric will be used in tires. There are a number of basic methods by which fabric can improve tires and reduce costs: new cord constructions, new and improved materials, improved processing, the proper quantity of cord material per tire, and new tire constructions of cord or other reinforcing materials.

There are two basic tools used by the tire fabric engineer. First, he must have a laboratory to test and screen new materials and to simulate the conditions of the cord or fabric materials in tires. Second, he must build tires and test them in the laboratory and on the road for final evaluation. He must build different kinds of tires—passenger, large and small, truck single bead, dual bead, on-the-road, off-the-road, high speed, aircraft, etc. He must think in terms of different types of service throughout the world.

What is the terminology of the tire fabric engineer? The suppliers of tire cord materials manufacture *fibers:* "a material whose length is many times greater than its width." Or, they may make *filaments:* "single continuous strands of fiber or textile material." They also make *yarn:* "an assembly of many filaments to form a continuous thread."

Varieties of Yarn

Basically, there are three rayon and three nylon yarns produced today.

(1) Rayon: Light 1100 denier,
Standard 1650 denier,
Heavy 2200 denier.

(2) Nylon: Light 720 denier,
Standard 840 denier,
Heavy 1680 denier.

Denier is a measure of weight. The lower the denier, the lighter the yarn. Thus a 1100 denier rayon is half as heavy as a 2200 denier rayon. Actually, the weight in grams of 9000 meters is a denier. Each yarn is made up of many tiny filaments. For example, the standard 1650 denier rayon yarn has about a thousand filaments.

The filaments look smooth and round. If we cut the yarn and look at the edge through a microscope, then we will see that the rayon filaments are crenulated and kidney-shaped (Figure 1). The nylon filaments are round, uniform and much larger (Figure 2).

Tire yarns are twisted into cords in our textile mills. One 1650 denier rayon yarn is combined with another 1650 yarn by twisting them together to make a 1650/2 cord. Similarly, one 840 denier nylon yarn

is twisted with another 840 yarn to make an 840/2 cord. We can also twist different numbers of yarns together to make other cords, such as three 840 nylon yarns to make an 840/3 cord.

Another textile term of great importance in tire cord is "twist." When we twist the yarns together with a large number of turns, we have high twist cord. When we twist the yarns together with a small number of turns, we have a lower twist cord. The lower the twist, the stronger the cord. However, the higher the twist the better the durability or resistance to fatigue. Thus, we must use a twist which gives the optimum balance between strength and durability.

Additional properties which are measured are: *Gauge*—thickness of the tire cord, usually expressed in inches. *Strength*—the force that a material will endure before breaking. Tire cord strength is normally given in pounds. Often cord strength is expressed as pounds per square inch. This can be calculated as follows:

$$\text{Strength (psi)} = \frac{\text{Strength in lbs.}}{\text{Gauge}^2 \times .7854}$$

Quite frequently tire cord strengths are expressed as grams per denier. This is called the tenacity of the cord.

$$\text{Tenacity (gpd)} = \frac{\text{Strength in lbs.} \times 453.6}{\text{Denier}}$$

Further terms are: *Elongation*—the increase in length of a tire cord when subjected to loading. Elongation is usually expressed as a percentage of the original length. Elongation of tire cord is normally measured at 10 lbs., 20 lbs. and at break. *Growth*—the elongation of a cord under load. *Heat Resistance*—the ability of a cord to retain its strength and fatigue resistance at elevated temperatures. *Moisture Resistance*—the amount of moisture a cord will absorb under controlled humidity conditions, and the ability of a cord to retain its strength and fatigue at those moisture contents.

Stability refers to the retraction or loss in length of a tire cord when subjected to special conditions. Rayon will shrink when it becomes wet, nylon when it is heated. *Adhesion* is the molding together of fabric and rubber. *Fatigue* means the ability of a tire cord to resist degradation when it is bent and forced to undergo repeated compression-tension cycles.

Adhesion of Rubber to Cord

When a tire is run on a road, some of the cords are placed under compression buckling or puckering. Thus, the cords go through a cycle of tension and compression with each wheel revolution. When a load is transmitted from the axle through the rubber, cord and tread to the road, the rubber must be stuck to the cord. Team work of all cords is a necessity. Each must bear its share of the load.

The adhesive is the important link which molds the rubber and fabric together. The adhesive film must have the elongating and compressive properties of the fiber, as well as the strength and tear resistance of the rubber compound. Adhesion is measured primarily in three ways:

(1) Statically at room temperature,
(2) Statically hot,
(3) Dynamically hot.

Just a special word about cord fatigue and fatigue failures in a tire. A margin of safety against fatigue failure must be maintained, but not too much of a margin. Fatigue resistance is usually obtained with any given material by use of excess twist and more material. These add up to considerable cost. Fatigue is the most elusive and difficult property to understand, define and measure.

Fatigue may be defined as breaking of the fiber while in service in a tire, from causes other than stressing the cord beyond its initial elastic limit. Fatigue is a cord failure which is not directly due to overstress, heat, cuts or chafing. One form of fatigue

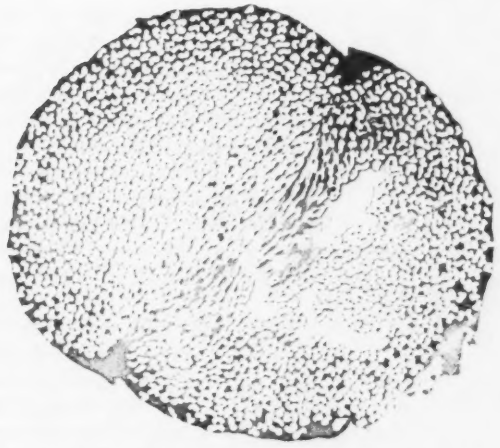


FIG. 1—Photomicrograph of rayon yarn in cross-section shows irregular filaments.

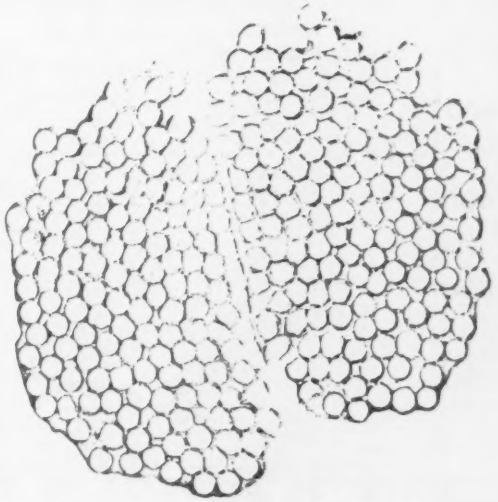


FIG. 2—A cross-section of nylon yarn seen through microscope reveals large, regular filaments.

is the result of abrasion of filaments on each other. This can occur within a cord. Localized flexing and buckling are another form.

There are a number of fatigue tests in rubber used by the tire industry. Each test has been developed to control the fabric fatigue for a particular combination of adhesive, compounds, cures, designs, etc. The compression-tension evaluations involve a tire, or a simulated tire which includes rubber, adhesive, cord construction and workmanship. Each test has a correlation to a degree with actual service failures. Considerable judgment must be exercised in such fatigue evaluations.

Quality Improvements

Another method of making tire improvements is by the use of improved quality materials. Each tire company defines new materials in terms of its own standards and needs. With regular rayon strength and fatigue at 100, the Super has a 20 per cent improvement in strength and a 25 per cent improvement in fatigue. Super 2 and Super 3 or Tyrex level represent increases in strength while holding the fatigue level. Similar quality improvements have been made in nylon. In addition, tire performance can be improved by the selection of the optimum time, temperature and tension during cord treatment.

The fourth method of improving tire performance is by selecting the proper quantity of any given cord. This is done by varying the size of the cord and the end count of the fabric. Tire cord is usually woven into a fabric with a definite number of cords per inch. Next, the fabric is dipped in an adhesive, treated with the desired time, tension and temperature to dry and stabilize the cord.

It is then calendered with a rubber compound. The number of cords per inch in the calendered fabric is the end count. The low count has more rivet area and thus more separation resistance than the high count. Conversely, the high count fabric is stronger because there are more cords. Selection of the proper count requires a balance between strength and separation resistance.

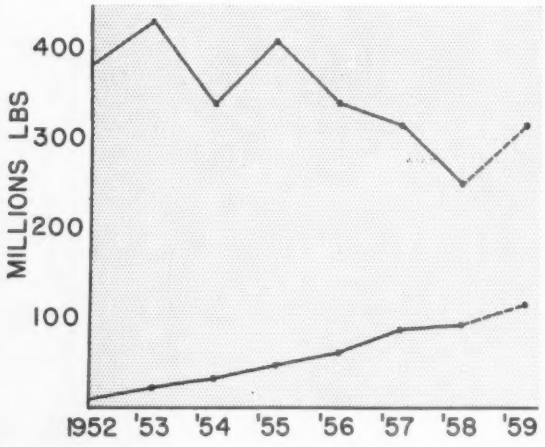


FIG. 3—Graph of tire cord usage. The upper curve represents rayon, the lower nylon.

The inch-strength of a tire then becomes a function of end count, cord quality and number of plies. Mathematically, inch-strength equals cord strength x cord count x number of plies in the tire. Our tire strengths have increased as we went from cotton to regular rayon to better processing to Super rayon to an optimum cord twist and, finally, to Super 2 rayon. A terrific struggle is now under way to see whether rayon or nylon will control the lucrative tire cord market.

Rayon is still dominant. However, nylon has been steadily increasing its share of the tire market and rayon has been losing position (Figure 3). Nylon producers recently reduced their yarn price 14c to $1.06 per lb. The rayon manufacturers countered with a drop of 5c on their 1650 denier and 4c on their 1100 denier. The new rayon prices are 55c for 1650 and 62c for 1100.

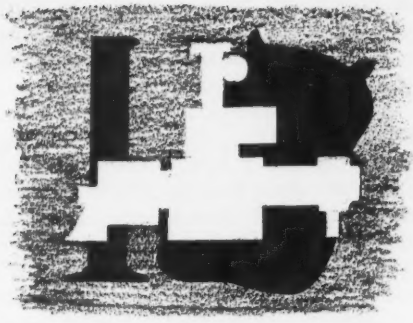
What about the future? In addition to price drops, both fibers are continuing to make constant improvements. In rayon, higher strength Super 3 and 4 materials have become available. One company at present is making a Super 3 rayon for the same price as Super 2. Also a lower 900 denier is being tested.

Nylon Innovations

There are several important nylon innovations: a high strength nylon has been developed. A lower denier 720 nylon is being tire tested. Nylon 6 is a lower melting point nylon that has shown considerable promise. Both standard nylon and Nylon 6 are made from the same chemical building blocks; however, the arrangement of these units is different. Large nylon cords offer another way of improving quality while reducing costs. At present, 840/2 is the nylon cord for tires, but nylon is very adaptable to large cord constructions. Therefore, a conventional nylon cord can be replaced with one that is three, four or five times larger.

In addition to new cord constructions, new processing methods and new adhesives, we are looking for new tire fibers. Of a great many new fibers, four are considered most promising. Polyester cord is a new class of fibers chemically different from rayon or nylon. Polyester is polyethylene terephthalate. Vinal is a polyvinyl alcohol fiber that was developed in Japan. HT-1 is a new high-modulus tire cord chemically related to nylon. Polyolefin represents another very new and important fiber discovery. Polyolefin fibers are polymerized from propylene and other petroleum derivatives.

Will nylon replace rayon and some new fiber replace nylon, or will it be necessary to use different fibers, different deniers, different cord constructions and different materials in new tires? Regardless of the answers to these questions, it seems certain that new fibers and reinforcing materials will play an important role in making better tires in the future.



COMPOUNDING
for Today's Tires

By KENNETH R. GARVICK
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RUBBER compounding is no longer an art. It has rapidly become a science.

Two charts illustrate some of the requirements and problems of present-day compounding. Figure 1 is a plot of tread temperature versus speeds in miles per hour. It shows the effect of overload in reaching a critical temperature earlier than for normal load. Also noteworthy is the increase in sloping of the overload curve above 80 mph.

Figure 2 is a comparison of tread temperature versus increasing tire loads at 50, 70 and 80 mph. As a reference point, the rated load is given as 1085 pounds. The sharpest slope increase occurs at 90 mph when the load is increased.

These charts provide the background for a consideration of compounding requirements for passenger, truck and off-the-road tires. First it would be helpful to review briefly the wide selection of materials available to the modern compounder.

Materials for Compounding

The first group of materials is source of rubber hydrocarbon.

The oldest known material still being used is natural rubber. The principal reason that natural rubber has remained in good standing so long is its ability to provide a high rebound, low hysteresis, abrasion resistance, heat resistance and natural tack in the uncured state. Where heat is the most critical factor, such as in large truck tires, natural rubber is still widely used, but in passenger tires, where other considerations are equally important, natural rubber is used primarily only in ply compounds for satisfactory building operation and effective high speed performance.

The "man made" natural rubber known as the isoprene type has all the desirable characteristics of natural rubber plus the marked advantage of uniformity from lot to lot. When the economic and supply problems are solved, isoprene will have the great possibility of replacing natural rubber depending upon world conditions.

The styrene-butadiene type (or "cold rubber") has the outstanding characteristic of being very compatible with present-day, fine particle size, abrasion furnace blacks resulting in wear resistance superior to natural rubber in passenger treads and also a lower rebound than natural rubber. This contributes to the application for lower modulus, reduced squeal and better riding passenger tires which will be described in more detail later.

A modification of "cold rubber" which is commonly referred to as "oil extended rubber" is basically a highly polymerized elastomer to which various types of petroleum oils have been added to reduce the Mooney to a satisfactory processing level. In addition to the economic aspects afforded by this rubber, it also lends itself well to the modern type passenger tread compounds mentioned before.

One of the newest developments is the series of "black masterbatches." These are either regular "cold rubber" or "oil extended rubber" to which abrasion resistant carbon black, with or without a dispersing agent, has been added to the latex prior to coagulation. It is generally recognized that "black masterbatches" made without a specific dispersing agent offer the best dispersion of the finer abrasion furnace blacks coming into extensive use.

Butyl rubber has been widely used in tubes for its outstanding air retention characteristics. It is also finding application in passenger tires due to its low rebound, weather resistance and flex crack resistance.

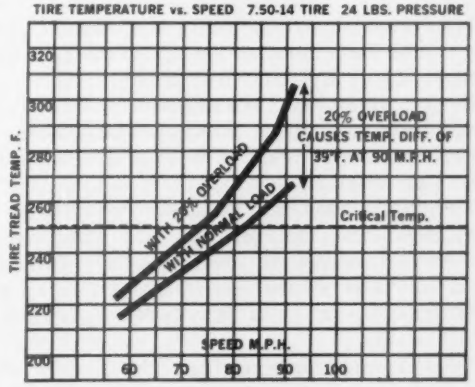


FIG. 1—A chart of tread temperature shows that overload and high speeds produce critical heat increases.

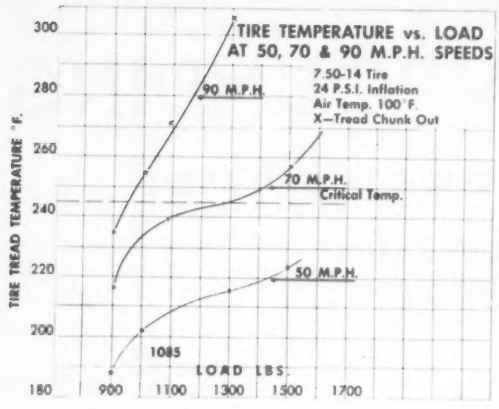


FIG. 2—Additional loads create heat build-up in treads much faster at higher speeds.

The qualities of neoprene which lend themselves to special application in tires are its flex cracking resistance and weathering resistance. Its present tire applications are in sidewall compounds and in treads of certain types of truck tires.

Hypalon, which also has outstanding weather checking and chemical resistance, is being blended with neoprene and natural rubber in the white sidewall compounds of some types of passenger tires.

Carbon Blacks

The second group of materials, making up the next greatest volume to the rubber hydrocarbon, are the carbon blacks which are made from either gas, oil, or a combination of oil and gas. This particular group is an extensive subject and can be touched on only briefly in this discussion.

The channel black types made from natural gas are still being used extensively, but are losing ground percentagewise to the oil furnace blacks. The principal uses of channel black in "Today's Tires" are with mixtures of other blacks in the inner plies or alone in the outer plies of certain tires.

The gas furnace blacks, principally known as SRF and HMF, have applications similar to channel blacks in ply compounds where they are specified to lower the running temperature of the tire and to help maintain satisfactory separation resistance.

Gas-oil type furnace black, generally GPF, is employed to some extent in ply carcass compounds, but has its widest application in the base and sidewall of today's passenger tires.

The oil furnace blacks must be considered in two categories. First, the FEF type may appear in any part of tires, except the tread wearing surface. The principal reason is that this black has many good characteristics, but lacks the important abrasion resistant quality.

The balance of the oil furnace blacks—HAF, ISAF and SAF—may be used to a limited extent in the plies of tires, but have their most important application in treads of different types of tires. The ISAF and SAF blacks have come into their own particularly since the introduction of oil extended rubber and the latest black masterbatch techniques.

Basic Compounding Principles

There are five basic compounding principles important to the understanding of this subject.

Reinforcement is accomplished by adding carbon black, zinc oxide or other fine particle size materials that improve the properties of the basic rubber hydrocarbon with minimum adverse effect. In other words, the ideal compound is one which has high tensile, high modulus, high elongation, with minimum heat build-up, maximum flex cracking resistance and low permanent set. Generally speaking, the higher the reinforcement, the more heat generation; therefore a balance is always necessary in determining the reinforcement required for a specific purpose in "Today's Tires."

The next item is processing. This is intended to include mixing, tubing, calendering, building and curing. This is the most important, since all materials must be capable of being processed satisfactorily in order for their desirable individual characteristics to be in the finished product. There is sometimes a tendency on the part of inexperienced compounders to disregard this factor, because they focus on the outstanding characteristics obtained in the laboratory. The compounds must be adaptable to existing equipment in the factory, or be so outstanding that they can justify the purchase of modified or new equipment for satisfactory processing.

The next basic compounding principle is cure. This is the stage where the green tire changes to its designed form. The word "cure" includes not only the actual curing operation, but also the zinc oxide, sulfur and accelerator, which are the three principal ingredients of compounds ensuring a satisfactory end product. The selection of these three types of materials and their amounts and combinations requires extensive compounding experience in order to create a compound compatible with all other parts of the tire—not only having good physical properties, but maintaining them throughout the service life of the tire.

Special Properties

The principal factor in determining relative air permeability of a tire innerliner compound is the type of polymer used. For example, natural rubber and SBR are only fair, while butyl and neoprene are outstanding. In this connection, butyl reclaim, while not as good as butyl pound for pound, is definitely better than SBR or natural rubber.

Another basic compounding principle is protection against ozone and other chemicals in the air. The rubber outer surfaces of the tires must be protected for both static and dynamic weathering. Protective waxes handle static protection fairly well, but, if used

in excess, can cause surface flex cracking. To protect rubber from dynamic weathering, one of the many good antiozonants available is required. Unfortunately, present antiozonants stain and cannot be used in areas that come in contact with white sidewall stock.

Last, but not least, for basic compounding is "cost." It is very important in tire compounding to be sure that the material is the lowest cost available for the purpose intended, taking into consideration the value received per dollar. For example, even though natural rubber may at times be lower cost than SBR type rubber, it would not be advisable to use all natural rubber treads on passenger tires due to the superiority of SBR in passenger treads for wear and cracking. In the opposite case, when natural rubber is higher cost than SBR, natural rubber would still be maintained in truck tires because of its superiority in wear when running temperature is a problem.

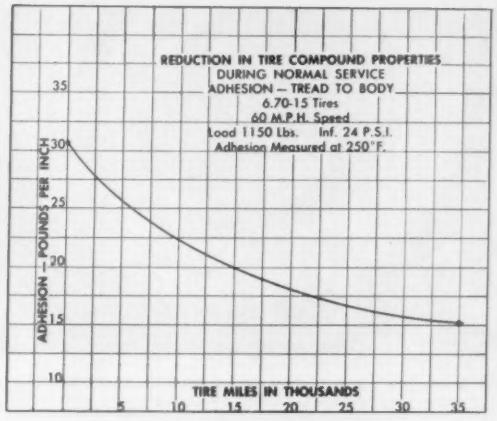


FIG. 4—Another plot of tread adhesion to tire body shows the influence of length of tire service.

Essential Compounds in a Tire

Figure 3 shows the tire tread to body adhesion in pounds per square inch versus tire temperature in degrees Fahrenheit. Note the sharp drop in adhesion of the tread to the body starting at approximately 225° F.

Figure 4 is an indication of the reduction in tire compound properties which is a plot of tire tread to body adhesion versus miles of service. Observe that the adhesion is predicted to drop faster in the early life of the tire and level off near the worn-out stage, assuming, of course, that the level obtained at any particular mileage is still high enough to maintain the tire intact under the particular service involved.

The body or carcass stocks composing the inner plies of a tire must have the best resistance to heat build-up and also to heat itself. This is accomplished by use of the coarser blacks which give good physical properties with low hysteresis. The compound for the outer plies of the tire must likewise feature minimum heat build-up, but due to the fact that these outer plies also need more resistance to separation, they must be higher modulus and higher tear resistant than the inner plies even though it may increase heat build-up. There must always be a balance between separation resistance and hysteresis.

In tires where breaker plies are employed, principally in truck and off-the-road tires, this compound must be an intermediate between the tread and the outer plies referred to before. This is necessary to minimize the shearing force which the tread stocks are constantly transferring to the more flexible ply stock of the tire. This balance of properties in breaker stocks is usually obtained by either channel black or a high modulus type furnace black in combination with natural rubber.

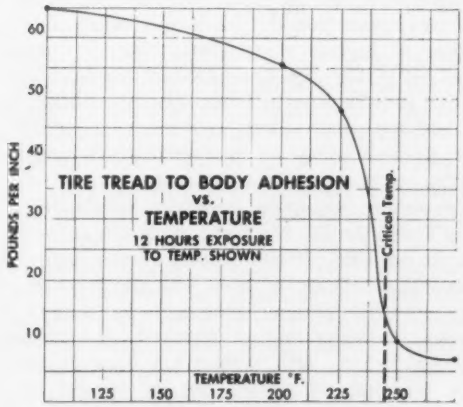


FIG. 3—The curve indicating tire tread adhesion drops sharply at about 225° F.

Tread and Sidewall

The tread or cap stock of a tire is the principal governing factor from a compounding standpoint of the ultimate tread life obtained from a tire. Current treads no longer contain very much channel black which was very popular before the introduction of furnace blacks and SBR type rubbers. A tread compound must be a balance between maximum abrasion resistance, maximum tread cracking resistance and minimum hysteresis or heat build-up. It is generally recognized that everything else being equal, higher hysteresis stocks will tend to wear faster and create more tendency to separate. This is especially true in high speed passenger tires and heavy duty truck tires. Of course, it also becomes a factor in off-the-road tires as speeds and loads of the vehicles increase.

The tread base of tires, where specified, must be a balance between the tread cap and the outer or breaker plies of the tire involved. Tread base stocks are used primarily to reduce running temperatures of the tires and lower the manufacturing costs, while still maintaining good tread wear life consistent with durability.

The sidewall of a tire is primarily a protection for the plies of the tire and must be able to resist cuts and snags, and be especially resistant to all types of flex

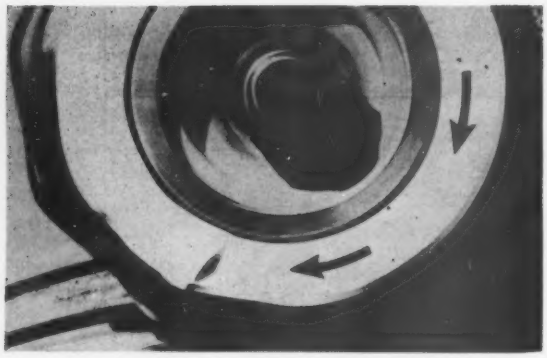


FIG. 5—A tire running at excessive speeds on a laboratory test wheel suffers marked traction waves.

cracks and weathering. Usually these stocks are essentially the SBR type rubber except in the large off-the-road tires where natural rubber is necessary for maximum snag resistance. The white sidewall compounds are basically natural rubber with some SBR or neoprene and/or Hypalon.

The compounds used as bead insulation, apex, wrap, flipper or chafer vary quite a bit among the industry. But, in general, the principal concern is that these stocks be compatible with the adjacent materials to provide a hard, firm bead without, however, leaving a radical step-off in stiffness between the bead area and the sidewall area of the plies. Naturally, the bead insulation stock is usually the hardest, while the compounds in direct contact with the plies are more like the ply compounds.

Compounding for Special Tires

In order to compound for special types of tires, it would be helpful to establish the requirements for each of the special groups of tires. First, under today's tubeless passenger tires we would list:

Air retention,
Satisfactory car performance,
Durability, especially at high speeds,
Retreadability,
Tread life.

The main object of air retention is to keep the air within the air chamber of the tire, not allowing it to permeate into the plies. This is accomplished by having a suitable gauge of air resistant stock compounded with neoprene, modified butyl, butyl reclaim, or similar materials. In a butyl tire, of course, the regular butyl ply compound would make an excellent innerliner.

From a compounding standpoint, car performance refers primarily to the characteristics of the tread compound which allow the tire to transmit the power and direction of the car. The tread compound must have a low rebound and yet low heat build-up, in order to give maximum traction, braking, cornering and desirable riding qualities. This is accomplished principally with high, oil-extended SBR type compounds containing fine abrasive furnace blacks, and yielding a compound hardness of approximately 50 to 55 Shore. This is in contrast to normal SBR compounds of hardness in the range of 55 to 60 Shore which are used on tires for older cars. Butyl tires with special designs have been developed to accomplish the same purpose.

Durability, especially at high speeds, means that passenger tires must not only transmit tremendous horse power between the car and the road, but must also resist excessive centrifugal force which results in tire and tread distortion. Figure 5 shows traction waves of a tire running at excessive speeds on a laboratory test wheel, illustrating what actually happens on tires today at high speeds. This dangerous distortion builds up heat which, if allowed to continue, may cause the tire literally to come apart. Traction waves become more severe as speeds increase, or if the tire is underinflated or overloaded.

Treads for Tubeless Tires

Today's treads must have low hysteresis, low permanent set and excellent flex cracking resistance to withstand this action. The compounder accomplishes this by very carefully selecting accelerator and curing agent ratios with both heat and flex resistant type antioxidants. In addition to the tread, the outer ply or plies of the tire are most important. These plies must have a very high modulus, high tear resistance and low hysteresis in order to hold the tread on the flexible body. High ratios of natural rubber with cool-running carbon blacks are necessary in these outer ply compounds, again with proper selection of the best available antioxidant.

Retreadability might be discounted by some, but is very important to the customer to get the maximum dollar value out of his original purchase. To be retreadable from a compounding standpoint, a tire must remain intact with minimum air leakage into the plies and no separations between any of the component parts. This is accomplished by a balance of compounds in the tire which can outlast the tread life built into the tire originally.

Figure 6 shows the effect of speed on tread wear. You will notice that the bar graph indicates the percentage of normal wear versus speed in miles per hour. Fifty miles per hour is taken as par or 100, the relative gain in wear at lower speeds is shown to the left and the relative loss in wear at the right. For approximately every 15 mph increase in speed there is a 50 per cent loss in tread wear.

To obtain maximum customer satisfaction, "Today's Tires" should, of course, wear out at the highest mileage possible. It has become increasingly difficult to maintain mileage of tires with the modern highly siped, flexible designs necessary on today's high-powered cars operating on freeways and turnpikes. As indicated before, SBR rubber has been an improvement over natural rubber, but the biggest improvement has come from the fine abrasion furnace blacks of the ISAF and SAF types.

The latest development in this respect is the commercialization of non-dispersant type black masterbatches. In these new masterbatches the carbon black is well dispersed and in intimate contact with the SBR polymer, without the excessive mechanical action previously required in conventional dry mix methods. Good dispersion offers maximum protection against flex cracking. In the near future, it is very likely that even finer, more abrasion resistant carbon blacks will be developed which can be incorporated by the new black masterbatch technique.

Compounding for Truck Tires

The principal requirements of truck tires which are different from passenger tires are as follows:

Low hysteresis, or low heat build-up,
Heat resistance,
Tearing resistance,
Tread life.

Low hysteresis or low heat build-up has become increasingly important. Due to the industry trend adding more and more tread thickness to both design and under-design volume, today's truck tires must withstand excessive temperatures for long periods of time. As fabrics and designs improve, tires go through a longer flexing cycle during their life; at the same time more and more truck tires are being retreaded. Natural rubber and the man-made isoprene type are very essential to the performance of truck tires.

Under high speeds and load conditions there is considerable heat build-up, even though tires have low hysteresis stocks. It must be counteracted by heat resistant antioxidants, and the proper accelerator and curing agent ratios. Tear resistance is particularly important in the outer plies, breakers, and tread surface area. It is accomplished by reinforcement with the wide selection of modern carbon blacks, which give good tear resistance yet have satisfactory heat build-up levels.

Where heat is a factor, as in truck tires, natural rubber still shows the best wear characteristics, particularly in combination with ISAF and SAF carbon blacks. The black ratios must be carefully selected to minimize flex cracking, and specific flex resistant antioxidants must be used in all heavy duty truck tire treads.

In the "off-the-road" tire group, we are particularly concerned with the earthmover, logger and mining type tires. These tires usually have the same low heat build-up type compounds as the heavy duty truck tires, except that the tread and sidewall must be especially cut and snag resistant. This is accomplished again by natural rubber type polymers with high loadings of either channel black or of ISAF or SAF carbon blacks. These particular tread compounds have high processing temperatures. A compounder must select the best delayed action type accelerator available, yet the final cured tread must be somewhat on the "loggy" side in order to be tough enough to resist the abusive action encountered by it.

In order to fulfill his special functions, a compounder must have at his disposal an extensive laboratory to determine the various desired characteristics. It should be noted that to date no widely recognized test has been developed for abrasion resistance. There are numerous other laboratory tests, however, which may be useful to the particular suppliers of rubber chemicals, but the compounder must obtain further answers from actual road wear tests of the particular tire and service.

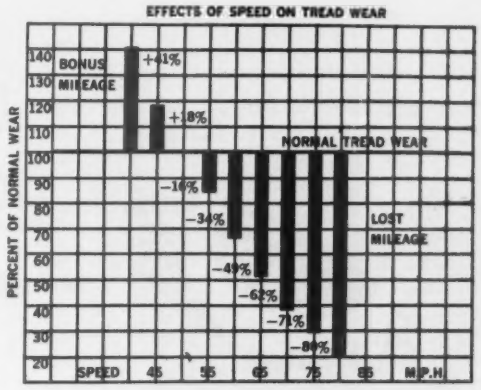


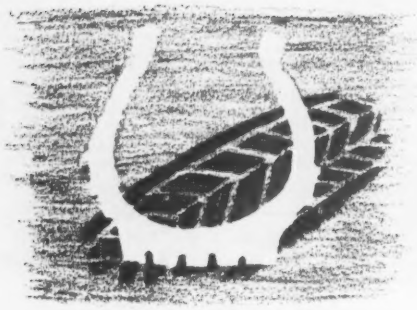
FIG. 6—A bar graph of tread wear shows about a 50 per cent loss for every 15 mph increase in speed.

Indoor wheel tests then are an additional tool for the compounder and he can usually get a relative answer on the following four characteristics: heat generation, flex cracking and cut growth, separation and high speeds. After the laboratory and indoor wheel tests indicate that the particular compound shows promise, it is necessary to obtain either a controlled fleet test or a commercial fleet test. The following items can usually be obtained from a controlled fleet test by the compounder: tread wear, tread cracking, heat generation, separation and general performance. Through commercial fleets the compounder can usually get the following: general performance, endurance and durability, weather resistance and retreadability.

Summary

In summary we would like to emphasize that the present day compounder continually needs to have for his evaluation extensive laboratory facilities, supplemented by adequate indoor wheel and road test setups, in order that he can constantly evaluate the many new polymers and rubber chemicals which are being developed. During the past decade rubber technology has definitely made the transition from art to science.

Finally, the compound performance of "Today's Tires" is judged not by laboratory tests or road tests, but by the satisfaction of the consumer. We are confident that, with the help of the suppliers of polymers and rubber chemicals, modern compounds will continue to keep pace and allow the full utilization of textiles, constructions and designs of the future.



DESIGN & CONSTRUCTION of Today's Tires

By KENNETH L. CAMPBELL

Firestone Tire & Rubber Co.
Akron, Ohio

SINCE the requirements for pneumatic tires constantly change, tire engineers sometimes feel like they are shooting at a moving target while standing on a pile of banana peels.

It is quite simple to illustrate the fact that the best materials in the world do not produce a useful product by themselves. Fortunately, there are ways of combining these materials in the proper amounts and locations to make tires available to the consumer which can meet whatever requirements he may place on them. These requirements continually vary with vehicle design, terrain, climatic conditions, laws, and even such elusive concepts as the attitude of the vehicle driver. Since the target is such an elusive one, tire designers have continually expanded the number and types of tires being made until today a company such as Firestone has over a thousand different tire items in its line.

The pile of banana peels on which the tire designer has to stand constitutes the meager theoretical and factual information which is available to him concerning the structure and dynamic action of the product. Despite the investment in electronic computing machines and the excellent staffs of research men, the design of the tire in the largest rubber companies is still based on practical and empirical, rather than theoretical, considerations.

This is not to say that the tire companies have been backward in this field, but rather that the product with which they are concerned has passed beyond the stage where theoretical factors are precise enough. The rapid strides made in the first forty years of this century are much like ground which was gained in a football game around mid-field. We are now getting much closer to the goal line and gains are measured in inches rather than yards. Also the effort expended to obtain these gains is many times that which was necessary thirty years ago.

At any rate, despite the complexity and difficulty of the job, the tire industry has been able to produce a continually better product which is performing tasks today that would have been thought impossible only fifteen years ago.

Current Tire Engineering

Two factors seem to provide the key to the requirements for today's tires. One is the increasing power and speed of all types of vehicles, and the other is the proposed construction of a highway system safely handling the vehicles which have been and will be produced. Both these factors are known and the challenge of providing the tire equipment to accommodate them has already been met in part.

For example, we made a survey not too long ago of 1256 cars which passed a certain spot on a road in Texas where we had stationed an observer with a stopwatch. This survey showed that over 80 per cent of the cars were traveling at least 70 mph actual speed. This would be approximately 75 mph on the speedometer. An amazing 35 per cent were actually traveling at 80 or over.

This is not surprising when you consider the horsepower that has been made available to the motoring public in ever increasing amounts (Table I). While this trend has seemed to level off somewhat, it is still true that the cars made since 1956 at least are almost all capable of sustained speeds in the high ranges which cause tire failures. A result of this speed capability in the wide open areas of our country is shown by a comparison of adjustments due to tire failures.

These figures point out the importance of speed to the tire designer. High speed does nothing to the tire that is mysterious. It is easy to show that centrifugal forces cause extremes in localized tire deflection and accompanying increases in tire operating temperatures. The effect of high temperatures on both textile material and rubber compounds is a reduction of strength and other physical properties.

Higher Speeds, Heavier Loads

When the adhesive bond between component parts of a tire becomes less than the centrifugal force tending to separate them, we have a typical high speed failure. This can happen with either tubed or tubeless tires, and it is perhaps unfortunate that the introduction of tubeless passenger car tires occurred during the years of "The Great Horsepower Race" with its high

TABLE I—PASSENGER CAR HORSEPOWER

	Year			
	1946	1950	1954	1959
Average All Cars	115	122	167	286
Light Weight	95	96	114	213
Medium Weight	106	119	169	294
Heavy Weight	143	150	217	334

speed operating conditions. At the same time, it is our feeling that, were it not for the introduction of the tubeless tire and its protection against sudden blow-out, the motoring public would have been in grave danger using the fast new cars.

One factor which affects tire temperature directly is the amount of load on the tires. Increasing load can bring a tire beyond the critical temperature just as high speed can. Generally, in passenger car design, we can depend upon loads being limited to two or three passengers and a small amount of baggage, although there is the occasional heavy load when a family goes on a trip or the passenger car is used as a light delivery truck.

Despite this relative lack of "payload," we have been confronted in the last 25 years with a continuing trend toward heavier front axles. Today the overload on some front tires amounts to as much as 13 per cent, so the problems of temperature created by heavy loads are with us regardless of the number of passengers and amount of baggage carried. Incidentally, there is, of course, a correspondingly lighter load on rear drive wheels which makes for some problems of its own.

Figure 1 shows the effect of increased loads on tire tread temperatures and indicates that overloads of 13

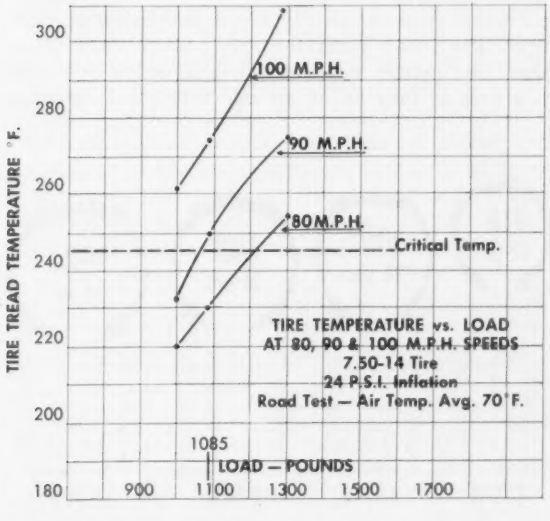


FIG. 1—Typical data showing the effect of increased loads on tire tread temperatures.

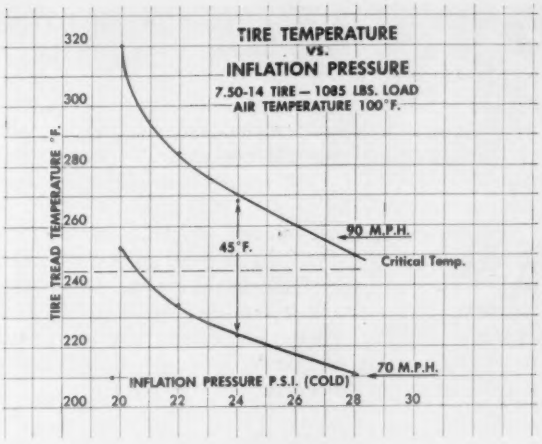


FIG. 2—Chart indicates that increased pressure takes many tires out of the critical temperature range.

per cent can easily make the difference between good and bad tire performance. In terms of high speed durability on the road, studies show that, if a 7.50-14 tire is used where an 8.00-14 is actually required, durability at high speed is reduced by one third. Another way of looking at this factor is by referring to data showing about three times as many adjustments of front tires in comparison with rears.

Varying the Air Pressure

Those who are familiar with tire design will undoubtedly have a ready answer for this problem: simply increase the air pressure in the tire. Particularly with thin passenger tires, load carrying capacity is proportional to air pressure, and increasing the pressure would take many tires out of the critical temperature range (Figure 2). However, the automotive engineer, who is responsible for selecting tire equipment, has determined that the general public demands extremely soft riding tires. The tire industry must compromise to meet this demand while trying to keep the durability of its product in a safe range.

Figure 3 shows the trend of the most popular tire sizes over the last thirty years and brings out the tendency toward lower pressures. It also illustrates in the change from the 15 to the 14-inch tires the importance of tire characteristics other than durability, since this change was made entirely for styling reasons.

One side effect of the demand for the extreme in soft ride has been a loss in potential tire economy. A typical test indicated that six additional pounds of inflation could increase the tread life of a tire very considerably. However, tires, like most other products today, are being designed to reflect the general disregard the public has for economy, and to cater to the public's desire for luxury. There is no accounting for the public's taste. In any business, it is best to find out what the public wants and then to provide it.

The 13-inch tire is not a further step in the trend

toward reducing rim diameters and pressures. These tires are merely smaller because the lighter vehicle has been scaled down and weight reduced wherever possible. Since the diameter of the brake drum permitted a smaller diameter rim, and since the weight of these compact cars did not require a larger tire, the 13-inch tire fitted the requirements for these new vehicles very nicely.

Indications are that mileage obtained on the tires on these cars will be at least as good as that obtained on the 14-inch tires of the heavier cars. Of course, the price of the tire is lower so the cost per mile of operation will be down. These tires have surprised us in their high speed performance—they will easily handle the maximum capacity of the cars.

Designing and Testing

Many of the "esthetic" performance requirements govern the limits within which a tire designer can operate. For example, the angles made by the cords in the crown of a tire cannot be less than 45 degrees without causing extreme instability and loss of steering control, nor can they be greater than 60 degrees without making the ride so harsh as to jolt passengers out of their seats. (These angles are measured in relation to a radial line from bead to bead.) In current practice, the angles in passenger tires vary between about 52 and 56 degrees.

This brings up an interesting point about how we test for ride and handling characteristics. Thirty years ago, the methods used were simple and quite crude. They usually consisted of putting observers in a car and driving the car over a prescribed route. Since that time, the industry has constantly worked on developing instruments which can reduce the ride variables to quantitative values (Figure 4).

Our latest ride test evaluation facilities have such advanced features as selective audio reception. They can be mounted in any position in the car (including the driver's position which is the most important), and they also have the great advantage of being able to be mass produced by relatively unskilled labor.

One recent development in passenger tire design has been publicized under the name of "low profile." This is another way of saying that a tire is "squatty" in cross section. One way of describing this feature of a tire's design is to refer to the ratio between the cross section height and width. The 15-inch tires have a ratio of about 93 per cent. The 14-inch tires are actually lower in profile, having a ratio of about 89 per cent, although they have never been referred to as low profile. The term "low profile" is not too easy to define. However, in order to make a substantial difference in tire qualities from already existing tires, the ratio would have to be at least down between 80 and 85 per cent.

An off-the-highway tire our company has been making since 1951 has a ratio of less than 60 per cent, so it can be seen that the possibilities in this area are quite wide. The main advantages claimed for low profile tires are concerned with the increased stability of the tires and consequent reduction in some of the vibrations felt by the passengers. These are offset to some degree by loss in the cushioning effect of the tire. However, as in most other tire design matters, the optimum profile for a tire on a given car eventually will be a compromise of these and other factors involved.

Improving Traction

One requirement made more important by the increased power and speed we have been discussing is traction. The need for improved traction has resulted in tread designs which have become increasingly cut up. This has provided the desired traction, but has forced the design engineer to work hard to keep the noise created by the vibration of small tread elements from being objectionable to the human ear.

Most tire companies have accomplished this by varying the size of the small elements in the tread. The most common noise treatments include from three to five different pitch lengths placed in extremely complex patterns around the circumference of the tire. Each company seems to have a different noise treatment, but almost all of these are arrived at by trial and error development rather than any method of scientific calculating.

In summary then, I believe we are today producing tires for passenger cars which provide the motoring public with soft, quiet riding qualities, good steering control, excellent traction and, despite pressures in other directions, ever increasing safety and durability (Table II). For comparison, I would like to discuss truck tire design and construction. Here again product design is keyed to requirements, and these are even more varied than those for passenger car tires.

One item which affects all tires is the climate. Total tire mileages are inversely proportional to the atmospheric temperature. This is merely additional evidence that heat adversely affects tire performance.

The difference between tire requirements on different wheel positions greatly affects the design of truck tires. Front tires generally carry heavier loads, since state laws permit the same axle load on an axle with two tires as they do on an axle with four. In order

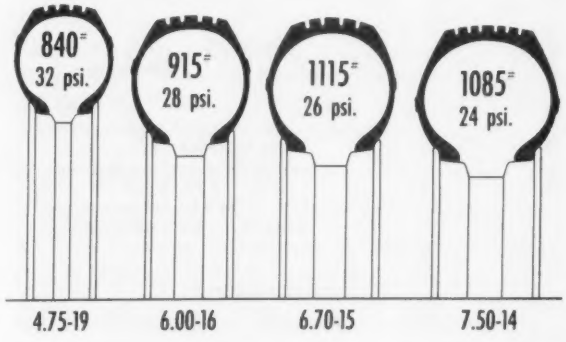


FIG. 3—Diagrams illustrating the trend toward smaller tire sizes during the last thirty years.

to get maximum payload, it has been customary for vehicle designers to move additional weight to the front axle. Of course, tires on this axle must be as safe as possible and must be resistant to irregular wear caused by the freedom of motion of front wheels.

Drive wheels on the other hand must be designed mainly to produce the maximum resistance to tread abrasion. Trailer tires must be similar in many respects to front wheels. They are also subject to a great deal more damage from cuts and punctures. For this reason, retreaded tires are very popular for trailer usage.

Requirements for Truck Tires

In addition to the effects of climate, laws and wheel positions already discussed, trucks are faced with a wide variety of road surface conditions. All of these things have prompted the development of a variety of relatively special purpose tires as shown in the versatility of a typical line of truck tires in the 10.00-20 size. This line of truck tires is, of course, further complicated by the necessity for different ply ratings and cord body constructions for different types of service.

Truckers are no less aware of the need for traction than are the owners of passenger cars. In fact, most progressive trucking companies now have safety departments which investigate such factors very thoroughly. In some areas of this country, bad road conditions make extra traction treatments of tires necessary. All of them seem to be effective in producing additional traction on wet pavement or other slippery surfaces, and each different treatment has its proponents.

Of course, the basic tread pattern molded into the new tire provides traction features. Here again, as in passenger tire design, increased traction elements are likely to cause noise. A comparison of the noise levels of some basic patterns shows that there is a great opportunity for the design engineer to minimize noise by proper choice and variation of tread elements.

One of the most talked about new construction features in truck tires is what we call the radial type tire. This tire depends upon an entirely new concept of cord body construction. Only one body ply holds the air pressure in the tire and its cords run radially from one bead to another. Then there is a series of narrow plies under the tread portion of the tire forming an inextensible band which minimizes tread motion in the contact area. By cutting down on tread motion, we can cut down on the amount of rubber worn off on each revolution of the tire, and tires of this construction can give as much as twice the mileage of a tire of conventional construction.

There are still many problems to be overcome in making such a radical change in tire construction, both in design and factory production techniques. However, the opportunity of increasing tread life to such an extent has encouraged many rubber companies to start small scale production in order to develop this principle more fully.

TABLE II—TIRE MILEAGE COMPARISON

Year	Tire Size	Average Mileage
1910	30 x 3½	4,000
1920	30 x 3½	9,500
1930	4.75 - 19	16,000
1940	6.00 - 16	22,000
1950	6.70 - 15	25,000
1960	7.50 - 14	27,000

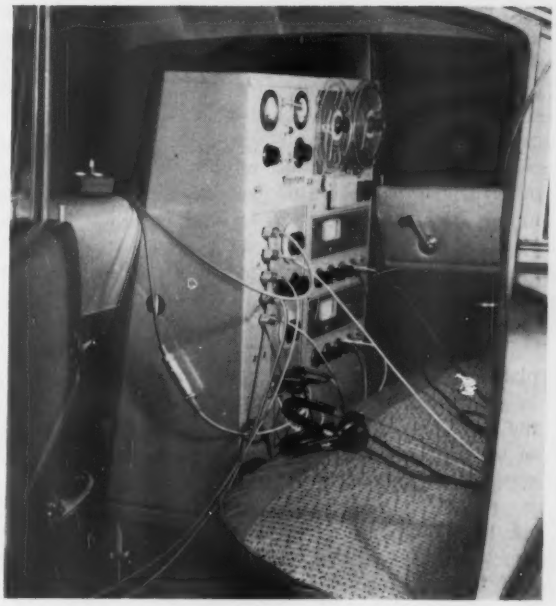


FIG. 4—Research departments rely on modern test equipment such as this unit at Firestone.

What the Designer Controls

There are a few items besides tire profile, dimensions and crown angle which are exclusively the responsibility of the designer. He also specifies the type of cord fabric, the number of plies and the number of cords per inch in these plies, although in this area he must work hand in hand with the textile group. The strength and fatigue resistance of the tire determine these choices.

It is common to maintain enough space between cords to permit adequate adhesion of the adjacent plies and of the tread to the cord body. For this reason, it is common to see truck tires particularly, built with a maximum end count in the inner plies and a more open end count in the outermost plies. In order to provide additional impact resistance in the tread area of the tire where it is most needed, tires have for many years had additional plies of fabric extending across the tread area only. These have been commonly called "breaker plies." Their use in passenger tires has just about vanished but they are still common in almost all truck and off-the-road tires.

One other item determined by the designer is the total thickness of the plies. Since this affects the total thickness of the tire and thereby the heat dissipation properties, it is an important item. In general, we strive for the minimum gauge which will produce adequate resistance to shear-type failures between the plies. Here again, we must rely on tire tests to determine proper values. One way of maintaining minimum gauges of the plies is to insert additional layers of rubber between plies in the areas where they are most needed. This is effective, although it requires the handling of an additional piece in the factory and, therefore, is more costly.

The tire designer is responsible for the amount and placement of rubber in the tread and sidewall. This, in combination with the contour of the mold which the tire designer must also determine, gives the shape of the finished tire. It is possible to vary this shape somewhat by placement of the rubber tread compound. Adding more material in the shoulder area of the tire will make the tread flatter but, at the same time, increases the running temperature because of the additional thickness of the total tire. In this area of tire construction as in most others, we try to compromise among all desired properties as best we can.

Determining Proper Bead Wire

One more major area with which the tire designer is concerned is the bead of the tire. He can change the shape and stiffness of the bead by varying the way the plies are wrapped around the bead wire, by determining the amount of bead wire to be used, and by adding pieces of reinforcing fabric around the bead bundle. He can also put the proper gauge and types of material on the outside of the tire, where it fits against the rim, to resist abrasion.

The bead wire necessary to resist the forces of inflation is much less than that actually used, although we do calculate the actual tensile strength required for a bead as a safety measure. Additional wire as well as other pieces of material are sometimes put in the bead area of a tire merely to give it bulk and help it resist the motion of the tire bead with relation to the rim. In combination with these internal construction features, the diameter of the bead and the contour as determined by the tire mold are extremely critical in regard to proper bead service. A variation of a few thousandths of an inch in the critical area can make the difference between good and bad beads.

One final area in which the tire designer has certain authority is in fixing tolerance on such things as balance, radial runout and splice overlap of the plies. These items are usually selected in order to prevent excessive tire disturbances on the vehicles for which the tires are designed.

Since design compromises to produce such things as soft ride have not been so necessary in truck tires, the gains in durability and economy of tire operation have been even greater than for passenger car tires. We have records in our files of truck tires giving over 400,000 miles on the original tread. Added to this increase in tire mileage has been a continuing decrease in the number of premature failures. Generally speaking, today's truck tire is capable of delivering long, trouble-free service at low cost to the truck operator even under the most severe conditions presented by the use of our already existing super highway system.

Off-the-Road Tire Design

Turning for a moment to off-the-road tires, we find a field of tire design that, in my opinion, is more varied and challenging than any other. There is a wider range of conditions—anywhere from extremely heavy loads to extremely light ones—road conditions varying from excellent to terrible. This wide variation in conditions can be demonstrated by the difference in the number of hours of service obtained on identical tires at different mines at the Minnesota Iron Range. There is, further, an extremely wide difference in concept of vehicle design to meet the multitude of tasks presented in this field.

There were only two sizes of large off-the-road tires available 25 years ago. Today the list of sizes is much longer and for every size there is a series of different tread patterns and tire constructions, as well as different ply ratings. And each day brings new requests for sizes and types of tires not currently available.

The most dramatic change in the off-the-road tire picture has been caused by the recent increasing tendency to move mountains instead of hills, and to move them long distances at high speeds. The resulting requirement for tires capable of operating successfully for long uninterrupted distances at high speed has caused heat problems even more severe than those discussed in relation to passenger car vehicles. Some data we have obtained on giant tires under extreme conditions of this kind illustrate the point. For example, at a constant speed of 33 mph, increasing the length of haul from 2.5 to 4.0 miles causes an increase in tire temperatures from a safe range to a critical range (Figure 5).

Tires on a vehicle 30 per cent overloaded, run at a constant speed of 18 mph, reached critical temperatures after 40 miles of operation, and temperatures never stopped rising. Studies have also shown that, with continuous operation on a given unit, tire temperatures reached equilibrium at a safe level when the vehicle speed was 12 mph, leveled off at a borderline value when the speed was held to 18 mph, and increased into the danger area without ever leveling off when the speed was held to 29 mph.

Operations of this kind, then, require tires of special constructions which are designed to reduce heat to a minimum. These tires must contain the best and most ingenious combination of fabrics and compounds, as well as design features which assist in cooling off the hot spots of the tire and resisting heat build-up. Tread design features that we can vary to help achieve this include reducing the tread depth, and reducing the size and massiveness of tread bars.

Such changes in designs, however, can only be made by changing the mold, and usually new molds

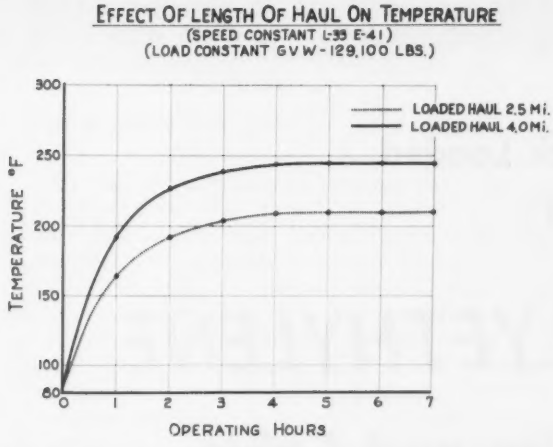


FIG. 5—Effect of length of haul on tire temperature at a constant speed of 33 mph, load constant gvw at 129,100 lbs.

are required to make any kind of substantial difference in heat build-up. Since molds in the sizes we are talking about can easily cost $50,000, development of these special purpose tires is particularly costly. In this comparatively little known field of off-the-road tire engineering, the combined team of textile men, compounders and designers is making a most significant contribution to our economy.

All this tire development work I have been discussing isn't easy. Gains in inches are paid for in terms of millions of dollars. Testing machinery and facilities alone require a tremendous investment. However, we must face the fact that this is the price of progress in the improvement of a product already as well advanced in design as a tire.

Achieving Standardization

Finally, mention should be made of one other vitally important contribution of the tire designers to the automotive industry and the public—the field of standardization. Through the cooperation of the tire manufacturers in this country, the Tire & Rim Association has been able to establish complete interchangeability of tire and rim parts. Those of you who are acquainted with areas of the world where standardization has not been promoted realize that this characteristic of most American industries is responsible in no small way for our material progress.

People take it for granted that, if their car came equipped with one manufacturer's 7.50-14 tires, they could buy 7.50-14 replacement tires of any brand and have them fit successfully on the rims with which the car is equipped. Further, when the tread is worn off, they expect the tire body to be fitted into any make 7.50-14 matrix for retreading. Standardization in such a highly competitive industry as ours is not achieved without a good deal of sweat and tears and occasionally a little blood, and I believe I can safely claim that this is one of the very important contributions of tire designers to today's tires.

In 1955, Charles Kettering, speaking of achievements in the auto industry said, "The pneumatic tire was the basis of our industry. The story of the pneumatic tire is one of the most impressive engineering stories in the world." I am glad that the tire designer has been able to take a place beside the developers of textile and rubber materials in making this story possible.

Coming Soon . . .

Radiation Resistance of the Neoprenes—By Robert Harrington, Hanford Atomic Products Operation, General Electric Co., Richland, Wash.

The sixth in a series of articles concerns the effects of ionizing radiation on the physical properties of neoprene polymers, with comments on the potency of selected compounding ingredients.

Black Masterbatch Panel Discussion—By Southern Rubber Group, St. Petersburg, Fla.

Three papers presented at the Summer Meeting discuss continuous vulcanization, production of dispersant type black masterbatches, and their uses in compounding.

Castor Polyol Urethane Elastomers—By T. C. Patton, A. Ehrlich and M. K. Smith, Baker Castor Oil Co., Bayonne, N. J.

Proper selection of prepolymer castor polyols insures tailor-made physical properties of low-cost compounds with numerous commercial applications.

Improved Butyl Rubber Vulcanizates—By C. J. Jankowski, K. W. Powers and R. L. Zapp, Enjay Laboratories, Linden, N. J.

How superior butyl rubber vulcanizates are obtained by replacing normal sulfur loading and accelerator with sulfur donor and low sulfur-high accelerator vulcanization systems.

PLUS R/A SPECIAL INDUSTRY REPORT

Towards More Efficient Purchasing

A round-up on purchasing techniques used by some major rubber manufacturers.

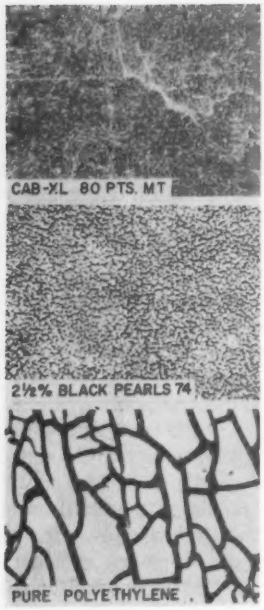


FIG. 1—Resistance of CAB-XL to Weatherometer exposure (top), compared with other compounds.

Carbon Black Loaded, Cross-Linked

POLYETHYLENE

in Wire and Cable

By B. B. S. T. BOONSTRA and ALLEN C. BLUESTEIN

Godfrey L. Cabot, Inc., Cambridge, Mass.

Anaconda Wire & Cable Co., New York, N.Y.

THE USE of a pure hydrocarbon for electrical insulation was recognized early in the development of the cable industry. The advent of synthetic high molecular weight hydrocarbons increased this applicability tremendously, and the flexibility, chemical stability, and purity of polyethylene have made it a special favorite material in the electrical wire and cable field.

The shortcomings of the material—well known, of course—are in general: (1) Poor ultraviolet light resistance; (2) Plastic flow at elevated temperatures; (3) High shrinkage due to high degree of crystallinity at room temperature, and (4) Stress cracking in detergents or at temperature changes. The first drawback has been virtually overcome by compounding the polyethylene with 2 to 3 per cent of a fine particle size carbon black of the color black type, which effectively screens out the deleterious ultraviolet from ordinary daylight.

For the other three defects, the remedy is not quite so simple. Although attempts have been made to eliminate plastic flow by using an extremely high molecular weight polyethylene, the processing of this material is difficult and makes it rather uneconomical for most applications. Another way of reducing plastic flow is cross-linking by irradiation, but this is impractical for competitive or large dimension items. In both cases, stress cracking resistance is also improved.

Plastic flow, excessive shrinkage and stress cracking are all improved by chemical cross-linking. By simultaneous incorporation of carbon black, these improvements are such that the compounds may be considered a new class of materials. This is particularly true, since the type and loading of the carbon black may be varied to obtain widely divergent electrical and mechanical properties. For example, see Table I.

It is obvious that the blacks may give the compound great variation in properties, but it is imperative that the stocks be cross-linked to a relatively high concentration of cross-links. Without cross-linking, the stocks containing higher loadings of black would be extremely brittle.

Cross-linking of polyethylene, with the resulting reduction of plastic flow and shrinkage, has long been an attractive project. Many attempts have been made to modify polyethylene chemically with reactive groups to enable it to cross-link. None of the attempts has been entirely successful in preserving the favorable polyethylene properties until cross-linking with organic peroxides was found. Though there are quite a number of effective organic peroxides, the one most commonly used is dicumyl peroxide (Di-Cup), and most of the following work was carried out using this material.

The advantage of the organic peroxides, Di-Cup in particular, is that they can be mixed on standard rubber and plastics mixing equipment. The chemistry of free radical production and cross-linking by Di-Cup

Note: This paper was presented before the Seventh Wire and Cable Symposium, Asbury Park, N.J., December 3, 1958.

has been reported [E. M. Dannenberg, M. E. Jordan and H. M. Cole, *J. Polymer Sci.*, Vol. 31, p. 127 (1958)].

Effect of Carbon Black

The first property for which carbon black was used in polyethylene was protection against ultraviolet light. The best balance, leaving most of the other pure polyethylene properties intact, is obtained with 2 to 3 per cent of a medium color channel black such as Monarch 74.

It was established in Cabot's laboratories that effective protection against ultraviolet is also obtained with coarser blacks at higher loadings. Even the coarsest black, the medium thermal type, protects the polyethylene from ultraviolet deterioration when used at loadings of around 100 parts phr. A compound containing nothing else but 100 parts of medium thermal per 100 parts of polyethylene, however, is a very brittle material and useless for almost any application. If this compound is prepared adding in the same operation 1 to 5 parts of an organic peroxide, such as dicumyl peroxide, and is then subjected to the reaction temperature of 350 to 400°F., a flexible material is obtained with a brittle point below —40°C. (depending on the amount of cross-linking agent added).

It may be interesting to go very briefly into the cause of this phenomenon. Low-density polyethylene is about 50 per cent crystalline at room temperature. This crystalline part consists of crystallites, often called spherulites because of their shape, which are not separate from the amorphous part, but are just stretches of macromol chains bundled together into a regular lattice. The ends or side chains of the same chains that form the crystallites may extend into the amorphous regions.

At elevated temperatures of 100 to 120°C., the crystallites melt and the whole mass of polyethylene is amorphous and somewhat rubberlike. In this state it can be mixed on a rubber mill with black and cross-linking agent. If the composition is allowed to cool at this stage, its tendency to crystallize will become so strong, that the molecular chains uniting into crystallites will force the carbon particles into the amorphous region, or at least put them under severe microstress. Such a compound is subject to breakage and stress cracking.

If all the black were forced into the amorphous part of the polymer, which can be about one-half of its total volume, then the actual loading in the amorphous part would be two times higher than the nominal loading. Instead of 100 parts of medium thermal black we would then have 200 parts, which almost completely saturate the amorphous polymer and make it very stiff. Such a whole compound consists of hard crystallites tied to very highly loaded and, therefore, very stiff amorphous compound. As a consequence, the compound is very hard and brittle.

Formation of Cross-Links

If the compound is heated to a reaction temperature of 350 to 400°F., where the polymer is in the completely molten state, cross-links will form at randomly distributed places along the chains. When the cross-linked compound is cooled to room temperature, the tendency to crystallize is greatly diminished due to the irregularities introduced into the molecules.

TABLE I—SOME MODIFICATIONS OF MAIN PROPERTIES OF LOW-DENSITY POLYETHYLENE BY COMPOUNDING WITH BLACK

Amount and type of black	2-3 parts phr of medium color black (particle size approximately 15 millimicrons)	40-80 parts of medium thermal black (particle size about 500 millimicrons)	400 parts medium thermal black	40 parts of conductive black (Vulcan XC-72) (particle size about 20 millimicrons)
Cross-linking agent	none	2 parts of Di-Cup	5 parts of Di-Cup	2 parts of Di-Cup
General appearance; natural and special properties	Deep black material with essentially the same properties as pure polyethylene, but with improved ultraviolet light stability and slightly inferior electrical properties	Grayish black material; mechanical properties close to those of pure polyethylene. Slightly higher dielectric losses and dielectric constant; lower dielectric strength; still excellent insulator.	Boardlike gray-black material; can be nailed, drilled and machined.	Black, tough and flexible material, somewhat stiffer than pure polyethylene; good semi-conductor with a resistivity of 30-50 ohm-cm giving a very good bond with pure polyethylene.*
		Improved thermostability; freedom from stress cracking		Freedom from stress cracking
	Improved light stability			

*0.5% Di-Cup added

TABLE II—SOME TYPICAL CAB-XL DATA

Loading of Medium Thermal (Sterling MT) Black	0*	100	200	300	500
Di-Cup, pphr	0	2	3	4-5	5
Yield strength, psi	1700	2300	3350	3950	2100
Tensile strength, psi	1750	2700	3350	3950	2100
Brittle point, °C. (ASTM D746-55T)	<—80	—55	+5	>+20	>+20
Melt index	2.1	0.6	<0.1	<0.1	<0.1
Stiffness modulus, psi	27,000	60,000	—	—	—
Impact strength, Izod ft. lbs./in.	10	5	4	2.2	1.6
Yield strength at 100°C., psi	<50	100	300	500	1450
Tensile strength at 100°C., psi	<50	800	1250	1400	1450
DC resistivity, ohm-cm	$>10^{15}$	2×10^{11}	—	19	—
Insulation resistance, megohm constant per 1000 ft.	>200,000	60,000	—	—	—
% Power factor, 1000 cycles	0.05	1.3–2.0	40	—	—
Dielectric constant, 1000 cycles	2.3	8.2	>20	—	—
AC breakdown on No. 14 wire, 60 mil wall, volts/mil.	800	170	<100	—	—
Stress cracking, hours in 1% Igepal at 70°C. under biaxial stress to 50% failure	1	>750**	—	—	—

*Pure polyethylene
**No failure after maximum running time of test = 1 month.

Only very few and small crystallites can form, and the black is not forced into amorphous regions but stays evenly distributed. This bears out the belief that chemical bonds form between black and polymer during the cross-linking stage.

As a consequence of this cross-linking of the polymer and the fixation of the black, no major domains are present in the compound, which is flexible, nonbrittle and completely free from stress cracking. The processing and curing as described here are steps that are carried out in conventional rubber mixing equipment, and the whole procedure presents a very strong analogy to rubber manufacturing.

As already mentioned, all compounds were made with low-density polyethylene. The high-density polyethylene so far has not given satisfactory processing, and the level of properties of the high-density polyethylene is not raised as much as that of the low-density polyethylene.

Some typical properties of the compound (CAB-XL) are listed in Table II. Table III and Figure 1 show the resistance of CAB-XL to aging and water absorption. Table IV gives data on a special low-loss CAB-XL compound and a conductive CAB-XL compound, in comparison with regular CAB-XL.

Comparative Tests

In the following part of the paper, two carbon-filled, chemically cross-linked polyethylene compounds are compared with some of the materials which are now being used as coverings on various wire and cable products. The typical compounds for comparison were chosen from: PVC, low-density polyethylene, high-density polyethylene, and neoprene.

It should be realized that modifications of these compounds are available which fit specific requirements for one or more properties. Material of the CAB-XL type should also be considered capable of being modified or compounded to develop properties suitable for many wire and cable applications. The simple compounds which are reported here seem to have their most immediate applications as service drop insulation or line wire covering. We have included considerable typical wire and cable specification data which are not common to these applications, in order to suggest the compounding direction to develop chemically cross-linked polyethylene for other insulation or jacket requirements.

Although the electrical requirements for service drop wire are considered more important than those for line wire, similar and sometimes identical materials are used for both products. Data shown in this comparison were obtained from actual factory run samples, wherever practical. The low-density polyethylene was a high-molecular weight material used as a high-quality line wire covering and as a jacketing material. The high-density polyethylene was considered to have an intermediate molecular weight. It has had limited service in these products usually where extreme abrasion conditions exist, such as in a heavily wooded area. The PVC is a typical proprietary compound with TW approval, which has also been used as a general purpose jacket and line wire covering. The neoprene compound is a typical line wire covering.

The question of which properties are important in these applications depends very much on the specific installation. It is obvious that weather resistance and long time aging are major factors. Some utility wire and cable specialists would say that flame resistance is vital; others feel it is of no real importance. Abrasion resistance greater than that required for installation purposes is actually vital to some installations,

TABLE III—RESISTANCE OF CAB-XL TO AGING AND WATER ABSORPTION

Treatment:	Loading of Black, phr	0	2.5*	100**
	Loading of Di-Cup, phr	0	0	2
Aging in oven @ 80°C. for one-half year for first two compounds; one year for the third compound	Absolute change in yield strength, psi	+200	+300	+400
	Relative change in elongation, %	—80	—83	—12
	Brittle point (ASTM D746-55T)	—25	—10	—40
	Relative increase in power factor, % (average 0.10-20 megacycles)	70	45	10
	Relative increase in dielectric constant, %	—2	—3	13
Thirty days in water @ 70°C.	Relative change in power factor, %	50	5	—18
	Relative change in dielectric constant, %	11	14	+2.2
	Corrected water absorption, mgr./sq. in	0.1	0.1	4.2
Oxygen absorption @ 120°C.	Induction period, hours	30	210	190
	Rate after induction period, % per hour	0.39	0.13	0.034
Weatherometer	Flex brittle point after:			
	0 hours	<—76	<—76	<—76
	500 hours	—10	—65	—76
	2000 hours	—	—55	—76
	8000 hours	—	—20	—70
	Appearance—See Figure 1			

*Medium color black
**Medium thermal black

but of practically no value to others. Most people agree that nominal electrical properties are adequate, but even here there is some disagreement on how much is adequate, with at least one major utility company maintaining that resistance to damage from electrical arcing is a major concern.

Essential Properties

Let us first consider those requirements which everyone agrees are important. The most damaging aspects of weather are usually considered to be ultraviolet light and ozone. The CAB-XL compound compares well with the plastics and is considerably better than the neoprene compound on ozone resistance. After 8,000 hours in an Atlas twin-arc Weatherometer and approximately one year of roof-aging in central Indiana, it showed no visible signs of damage. After one week in an ozone chamber at room temperature at the extremely high ozone concentration used to test cables to be installed in high-voltage systems, bent wire samples showed no signs of cracking. Long time aging, as measured by the usual accelerated oven and pressure vessel tests, show CAB-XL compounds to be at least the equivalent of the other materials.

As for the more controversial properties, our data show that this type of compound should answer almost any combination of requirements for such products. Room temperature mechanical properties, Table V, show the CAB-XL type of compound to be similar to neoprene, with the exception of stiffness, flex and abrasion resistance. Although considerably stiffer than neoprene and PVC, it is not much more so than the low-density polyethylene and is somewhat more flexible than the high-density polyethylene. Flex resistance is of the same order as the thermoplastics and its abrasion resistance is surpassed only by the high-density polyethylene.

TABLE IV—LOW-LOSS CAB-XL AND CONDUCTIVE CAB-XL IN COMPARISON WITH REGULAR CAB-XL

Type CAB-XL Compound	Low-Loss	Regular	Conductive
Low-density polyethylene	100	100	100
Sterling MT	100	100	—
Vulcan XC-72	—	—	40
XLC MgO	3	—	—
TBP	4	—	—
Di-Cup	—	2	2
Yield strength, psi	2300	2300	2400
Impact strength, ft. lbs/in.	4.5	4.0	—
Brittle point, °C. (ASTM D746-55T)	—50	—50	—60
DC resistivity at room temperature, ohm-cm	2×10^{13}	2×10^{12}	30-50
Power factor, 0.05-20 mc, %	4-6	8-10	—
Dielectric constant	4-6	8-10	—
Bond strength to pure polyethylene,* lbs./in.	—	—	>25**

*0.5% Di-Cup added
**Mostly breaks in either layer, not at the bond.

The high-temperature data (Table VI and Figures 2, 3 and 4) emphasize its thermosetting character which is similar to neoprene. The low-temperature characteristics of the cross-linked polyethylene are similar to those of the thermoplastic polyethylenes, and considerably superior to the typical neoprene and PVC compounds used for this comparison, at temperatures below —40°C. (Table VII and Figure 5).

Most of the heat aging tests (Table VIII) show retention of tensile and elongation of the same order as the other materials. Of course, at the higher temperatures, the low-density polyethylene melts. The CAB-XL compound shows significantly better retention of properties than neoprene after the 7-day, 121°C. oven test and considerably inferior retention in the hot oil test. The thermoset polyethylene shows

TABLE V—ROOM TEMPERATURE MECHANICAL PROPERTIES

	Low-Density PE	High-Density PE	PVC	Neoprene	Cab-XL 80 Parts	Cab-XL 100 Parts
Tensile strength, psi[1]	1850	3220	2200	2300	2120	2270
Elongation at rupture, %[1]	440	100	230	450	200	170
Flex Resistance[2]						
Cycles to crack	1000	1500	1000	>200,000	1000	1000
Width of crack, in.	1	1	½	——	1	1
Tear resistance, lb./in.[3]	108	175	63	48	44	37
Compressions cut, lbs.[4]	1230	1490	680	860	750	710
Stiffness modulus, psi[5]	25,000	75,000	7000	<1000	32,000	34,000
Abrasion resistance[6]						
*Cycles to abrade 4/64 wall						
20 lb. load	8500	260,000	6700	550	49,000	65,000
10 lb. load	9300	660,000	8400	1180	54,000	73,000
5 lb. load	13,000	——	9500	6900	172,000	179,000

(1) ASTM-D-412-51T; (2) ASTM-D-430-57T; (3) ASTM-D-470-56T; (4) U.S. Army C-100; (5) Clash-Berg, *Modern Plastics* (July, 1944); (6) ASA-Tree Wire Specification.

* First 6000 cycles are run wet, next 54,000 cycles are run dry. These cycles are repeated until entire covering is abraded to bare conductor. Figures shown have been corrected to the equivalent of 60 mils abrasion on all samples.

TABLE VI—HIGH TEMPERATURE BEHAVIOR

Test	Temp. °C.	Low-Density PE	High-Density PE	PVC	Neoprene	Cab-XL 100 Parts
Compression cut, lbs. (U. S. Army Corps Engineers No. 100C)[1]	25	1230	1490	680	860	710
	50	860	1260	390	720	400
	75	400	950	210	460	410
	100	30	85	40	340	170
	125	Melts	Melts	Melts	220	130
		Per Cent Original Tensile & Elongation				
15-Min. high temperature oven test [*AIEE Transactions*, Vol. 74, Pt. 111, pp. 913-15, (Oct. 1955)][2]	120	T.-E. Melts	T.-E. 104-100	T.-E. 99-101	T.-E. ——	T.-E. ——
	140	——	Melts	99-100	——	——
	160	——	——	111-104	——	——
	180	——	——	103- 91	100-93	97-85
	200	——	——	Melts	96-80	88-70
	220	——	——	——	76-50	86-33
	240	——	——	——	62-35	85-19
	260	——	——	——	52-22	81-11
4-hr. current overload at conductor temp. 260°C. [*AIEE Transactions*, Vol. 74, Pt. 111, pp. 916-19 (Oct. 1955)]		Melts	Melts	Melts	Badly embrittled	Embrittled, but not cracked
		Per Cent Original Wall Thickness				
Deformation vs. Temp. (*U/L Standard for Thermoplastic Wire*, 3rd Ed., p. 11)[3]	100	99	100	83	89	100
	120	0	100	78	90	84
	140	—	0	53	90	82
	160	—	—	24	90	84

(1) See Figure 2; (2) See Figure 3; (3) See Figure 4.

TABLE VII—LOW-TEMPERATURE CHARACTERISTICS

Test	Low-Density PE	High-Density PE	PVC	Neoprene	Cab-XL 80 Parts	Cab-XL 100 Parts
Brittle point °C. (ASTM-D-746-55T)	<—70	<—70	—23	—30	<—70	<—70
Cold bend —65°F. 7 days (MIL-C-3432A)	Passed	Passed	Failed	Failed	Passed	Passed
Relative torsion modulus 7 days —55°C. (ASTM-D-1053-52T)	7.7	4.4	230	460	12	26
*Torsional stiffness vs. temperature (ASTM-D-1043-51)	Temp. °C.	Torsional Stiffness, psi				
	30	22,000	54,000	4,900	—	23,000	26,000
	20	26,000	82,000	7,200	—	34,000	35,000
	0	41,000	150,000	21,000	—	78,000	78,000
	—20	79,000	214,000	96,000	2,700	187,000	196,000
	—40	167,000	265,000	311,000	58,000	441,000	405,000
	—55	235,000	—	—	—	486,000	473,000

* See Figure 5.

TABLE VIII—HEAT AGING CHARACTERISTICS, PER CENT ORIGINAL VALUE

Material	T.[1,3] E. 4 day 70°C. Oxygen[4]	T. E. 7 day 70°C. Oven[5]	T. E. 2 day 100°C. Oven[5]	T. E. 5 day 100°C. Oven[6]	T. E. 20 hr. APHT[6]	T. E. 42 hr. APHT[7]	T. E. 7 day 121° C. Oven[5]	T. E. 18 hr. 121° C. Oil[9]
Low-density PE	99- 99	115-107	100- 85	100-71	Melts	Melts	Melts	Dissolves
High-density PE	98-100	108- 86	109- 86	112-86	114- 86	117-86	109-103	Dissolves
PVC	95-111	105- 95	103-107	101-98	111-100	110-91	114- 55	107- 30
Neoprene	91- 83	98- 78	100- 84	98-62	86- 77	81-60	56- 13	95-100
CAB-XL 100 parts	101-105	110-102	111-103	109-92	101- 85	105-71	105- 81	23- 58

(1) ASTM-D-412-51T; (2) ASTM-D-430-57T; (3) ASTM-D-470-56T; (4) ASTM-D-572-53T; (5) ASTM-D-573-53T; (6) ASTM-D-454-54T; (7) ASTM-D-454-53T and U/L RHH; (8) ASTM-D-573 except 121°C.; (9) ASTM-D-471-57T.
T. = Tensile strength; E = Elongation at rupture; APHT = Air pressure test 20 hours @ 127°C. and 80 psi.

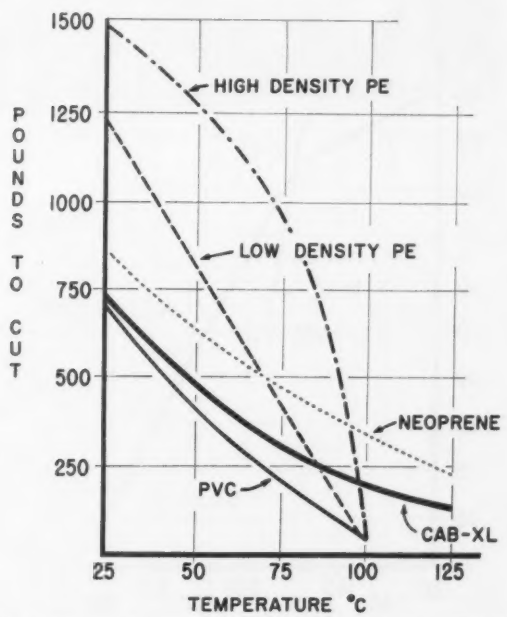


FIG. 2—Compression cut test shows thermoplastic characteristics of five compounds.

excellent ozone resistance, and resistance to electrical tracking at least as good as the other materials (Table IX).

Test Conditions

The test equipment for electrical tracking was a modified "Jacob's ladder," with a brass rod at an angle of approximately 15° from the vertical connected to a source of high voltage (Figure 6). The sample to be tested was clamped in a vertical position, the closest point between the sample and the high voltage brass electrode being approximately ¼ inch. A small grounded wire was wrapped around the outside surface of the sample at this point. Approximately 15 kv was applied. The time required for the arc to travel a given distance was recorded. The data reported here were obtained from samples of Number 10 AWG solid conductor with a 2/64 covering.

Although the CAB-XL type compound supports combustion, it has excellent thermal conductivity and is very difficult to ignite when tested on wire. The data, Table X, show that it actually passed Underwriter's horizontal and vertical flame tests, when run

TABLE IX—OZONE AND TRACKING RESISTANCE

	Low-Density PE	High-Density PE	PVC	Neoprene	Cab-XL 80 Parts	Cab-XL 100 Parts
Ozone resistance, 0.03% concentration, hours to crack (IPCEA S-19-81, 2nd edition, Part 4)	>168	>168	>168	2	>168	>168
Tracking resistance, seconds to travel 10 inches (Anaconda R & D method R-104)*	Melts & burns	Melts & burns slowly	73	33	100	100

* See Figure 6.

TABLE X—FLAME RESISTANT PROPERTIES

Material	Burning Rate ASTM-D-635 (Minutes/Inch)	Horizontal Flame, U/L Std. Non-Metallic Sheathed Cables, 5th Ed.	Vertical Flame
Low-density PE	0.6	Fail Burned completely	Fail Burned completely on 3rd application
High-density PE	0.9	Fail Burned completely	Fail Burned completely on 4th application
PVC	Self-extinguishing	OK No propagation	OK Extinguished when flame removed
Neoprene	Self-extinguishing	OK No propagation	OK Does not burn at any time
CAB-XL 80 parts	0.9	OK No propagation	OK*
CAB-XL 100 parts	0.9	OK No propagation	OK*

*While samples will not burn during regular 5 cycles of test, if test is continued for 6 to 8 cycles they will ignite and burn completely.

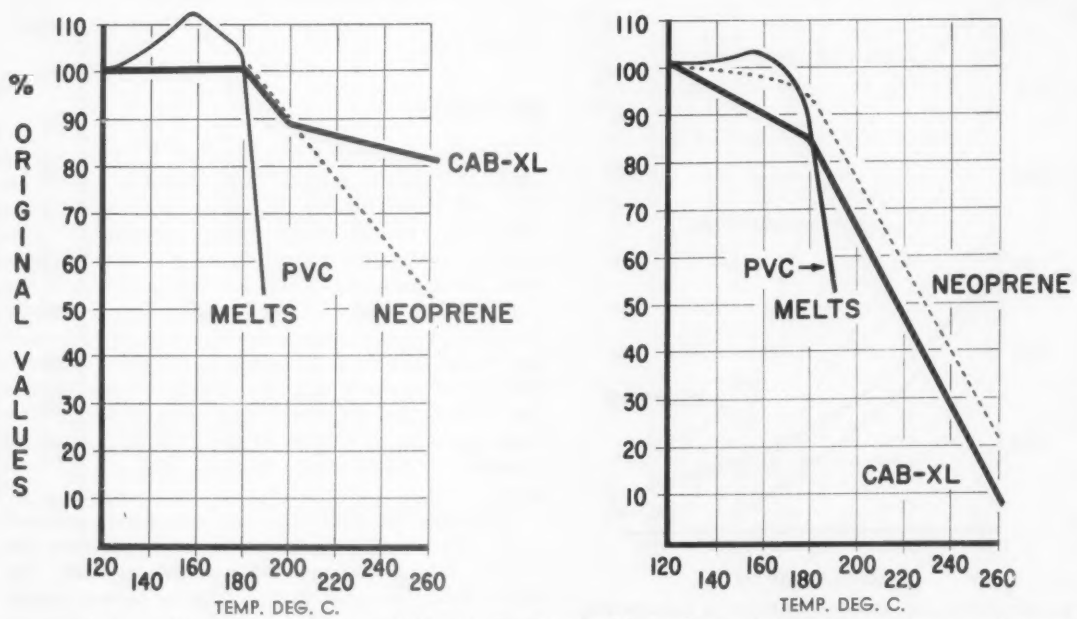


FIG. 3—Charts of tensile strength (left) and elongation (right) for the 15-minute high-temperature oven test.

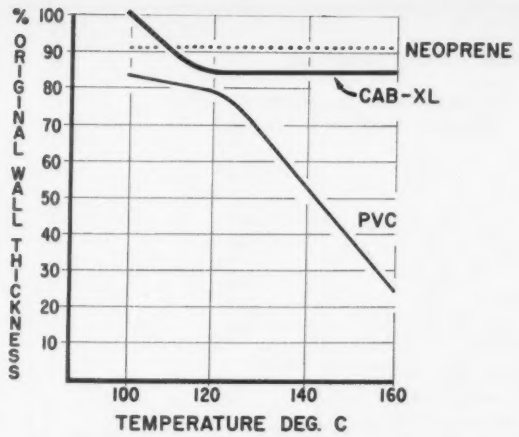


FIG. 4—Deformation versus temperature, using the U/L standard for thermoplastic wire.

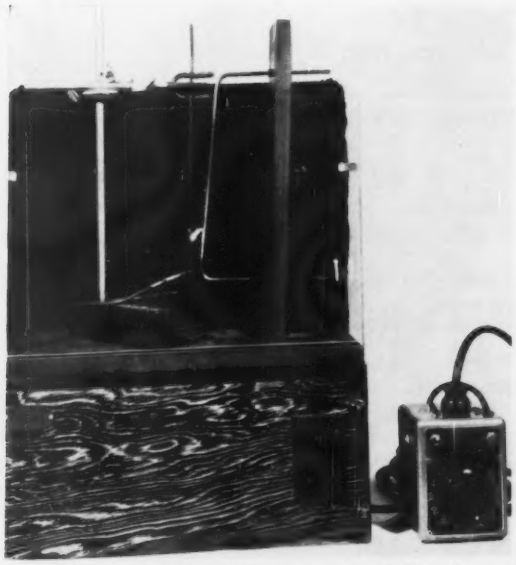


FIG. 6—Test equipment used to measure electrical tracking resistance.

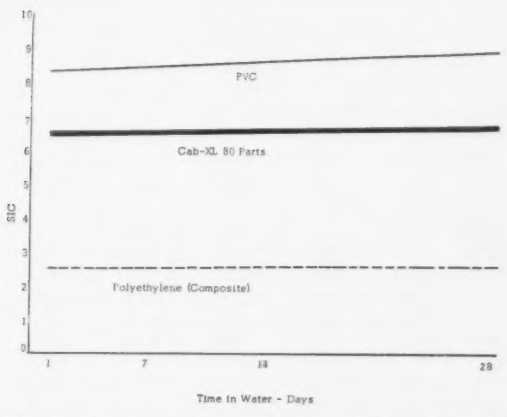


FIG. 8—Electrical moisture absorption test of specific inductive capacity, using 60 cps, 80 vpm, 70° C.

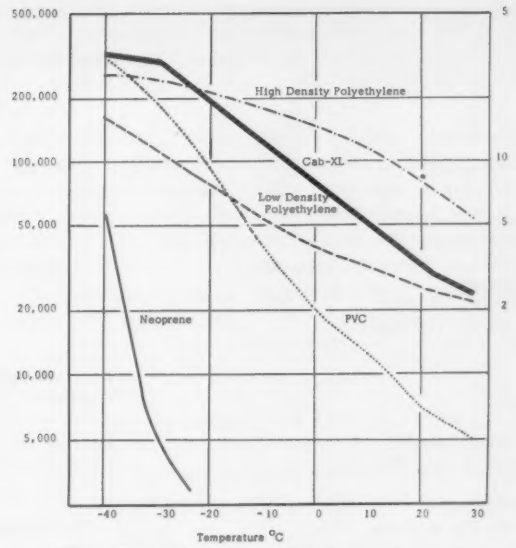


FIG. 5—Torsional stiffness, psi, at low temperatures.

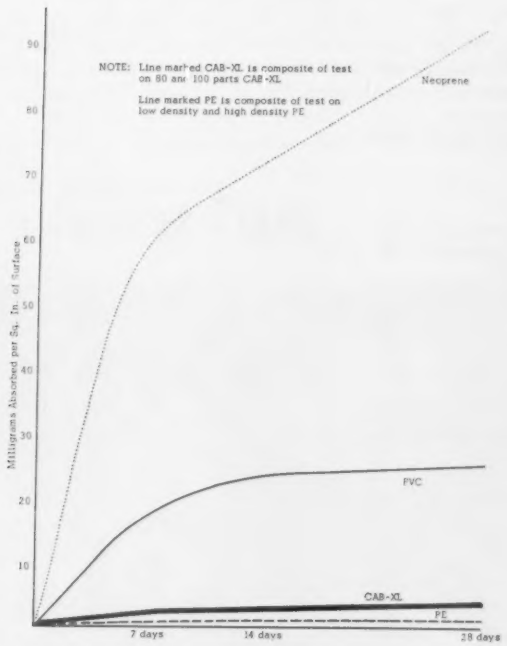

NOTE: Line marked CAB-XL is composite of test on 80 and 100 parts CAB-XL
Line marked PE is composite of test on low density and high density PE
Neoprene
PVC
CAB-XL
PE
Milligrams Absorbed per Sq. In. of Surface
7 days
14 days
28 days

FIG. 7—Gravimetric moisture absorption measure at 70° C.

on No. 10 solid copper with a 2/64 covering and on No. 4 strand aluminum with a 4/64 covering. This advantage would not be as noticeable if this type of material were used in very heavy walls or as thin jackets over heavy insulation walls.

The water absorption characteristics, measured by gravimetric or the various electrical means, show the cross-linked polyethylene to be almost as good as the excellent thermoplastic polyethylenes (Table XI and Figures 7, 8 and 9). Its room temperature electrical properties (Table XII) are very good, lying generally

Table XI—Moisture Absorption Characteristics

Material	Gravimetric Moisture Absorption @ 70°C.* Milligrams Absorbed Per Sq. Inch			
	1 Day	7 Days	14 Days	28 Days
Low-density PE	—	1.1	1.3	1.4
High-density PE	—	0.7	0.8	1.0
PVC	—	17.0	23.0	25.0
Neoprene	—	60.0	73.0	93.0
Cab-XL 80 Parts	—	1.8	1.9	3.7
Cab-XL 100 Parts	—	2.5	3.0	4.0
Electrical Moisture Absorption, IRK, 70°C. (Megohms—1000 ft., 10 solid, 2/64)				
Low-density PE	$>1.0 \times 10^5$	$>1.0 \times 10^5$	$>1.0 \times 10^5$	$>1.0 \times 10^5$
High-density PE	$>1.0 \times 10^5$	$>1.0 \times 10^5$	$>1.0 \times 10^5$	$>1.0 \times 10^5$
PVC	6.6	3.7	2.4	4.3
Neoprene	0.8	Too low to measure		
Cab-XL 80 Parts	$>1.0 \times 10^5$	3.8×10^4	8.7×10^4	1.1×10^4

Electrical Moisture Absorption, 1000 Cycles, 70°C.

	SIC				PF-%			
	1 day	7 days	14 days	28 days	1 day	7 days	14 days	28 days
Low-density PE	2.43	2.47	2.47	2.48	0.08	0.12	0.07	0.07
High-density PE	2.46	2.50	2.51	2.52	0.11	0.07	0.05	0.04
PVC	7.48	7.85	7.98	8.41	4.29	3.48	3.58	3.60
Neoprene	17.41	Failed			23.49	Failed		
Cab-XL 80 Parts	6.03	6.10	6.16	6.19	0.45	0.48	0.51	0.53

Electrical Moisture Absorption, 60 Cycles, 40 VPM, 70°C.

Low-density PE	2.49	2.51	2.50	2.51	0.26	0.18	0.21	0.20
High-density PE	2.51	2.52	2.54	2.55	0.35	0.23	0.20	0.20
PVC	8.21	8.45	8.59	8.94	7.08	5.47	5.03	4.57
Neoprene	Failed				Failed			
Cab-XL 80 Parts	6.33	6.37	6.50	6.57	1.31	1.85	2.20	2.24

Electrical Moisture Absorption, 60 Cycles, 80 VPM, 70°C.**

Low-density PE	2.49	2.50	2.51	2.52	0.20	0.23	0.21	0.20
High-density PE	2.52	2.52	2.54	2.55	0.25	0.18	0.20	0.20
PVC	8.31	8.49	8.59	8.97	7.58	5.67	5.03	4.63
Neoprene	Failed				Failed			
Cab-XL 80 Parts	6.50	6.48	6.57	6.67	2.41	2.41	2.50	2.57

*See Figure 7.
**See Figures 8 and 9.

Table XII—Room Temperature Electrical Properties

	Dielectric Strength*	IRK**	1000 Cycle SIC	1000 Cycle PF-%	40 VPM, 60 Cycle SIC	40 VPM, 60 Cycle PF-%	80 VPM, 60 Cycle SIC	80 VPM, 60 Cycle PF-%
Low-Density PE	1000	$>1 \times 10^5$	2.56	0.08	2.60	0.33	2.60	0.22
High-Density PE	1000	$>1 \times 10^5$	2.54	0.06	2.58	0.29	2.58	0.22
PVC	1000	5×10^5	5.75	6.70	6.03	6.02	6.07	6.06
Neoprene	300	10	12.0	8.0	15.77	17.54	16.58	20.44
Cab-XL 80 Parts	280	$>1 \times 10^5$	6.51	0.53	6.68	1.71	6.84	2.51
Cab-XL 100 Parts	180	3×10^4	8.16	1.80	8.88	2.86	9.31	4.26

*Rapid rise method on 10 solid, 2/64—volts per mil
**Megohms—1000 ft. on 10 solids 2/64

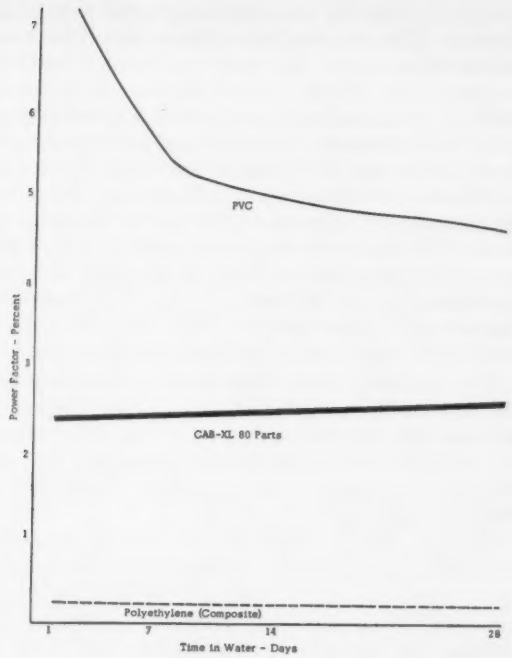


FIG. 9—Electrical moisture absorption test versus power factor, using 60 cps, 80 vpm, 70° C.

between the conventional polyethylenes and PVC. Its dielectric strength, however, is definitely inferior to that of PVC and of low- and high-density polyethylenes.

Although the carbon black loaded, chemically cross-linked polyethylene compounds are not the best in every test comparison made, they show a remarkable combination of desirable properties of interest to the wire and cable industry. There are many compounding studies to be made and operating data to be obtained before the full utility of this versatile new material will be realized.

Summary

Research was conducted on the properties of a class of material prepared from low-density polyethylene by compounding with carbon black and a chemical cross-linking agent, subsequently cross-linking.

It is stressed that a wide range of electrical and mechanical properties may be obtained by suitable compounding, varying the loading and the type of black. These properties may vary from a semi-conducting material to a low-loss insulator. All cured compounds are free from stress cracking and exhibit a minimum of plastic flow at elevated temperatures.

Insulating Pipes at a Rubber Plant

A VAPOR barrier insulation obviated condensation problems when chilled water lines leading from a refrigeration unit to the general offices of the Firestone Tire & Rubber Company, Akron, Ohio, had to be run through a rubber processing area of Plant No. 1 where high humidity conditions exist.

The 1⅛ and 1⅜ inch lines pass over a skid storage area for processed rubber. Condensation on the lines would have made a major traffic aisle slippery, would have fallen on stored material and on a portion of a conveyor.

To prevent vapor from forming on the outside of the chilled water lines, a flexible, foamed plastic insulation material was used. The insulation had to be of durable quality and easy to maintain because replacement would disrupt normal work flow in a busy area.

The material with a built-in vapor barrier used to insulate the pipes and to prevent condensation was Armaflex, made by the Armstrong Cork Co., Lancaster, Penna. Its closed cellular structure provides high thermal efficiency and prevents warm, humid air from coming into contact with the cold lines.

This efficient insulating material has also proved easy to work with. The pipe covering comes in tube and sheet form. The tubular forms can be slipped over the pipes or slit, snapped over the pipe and sealed with a waterproof adhesive.

Workman points to chilled water line insulated with flexible, foamed plastic pipe covering to prevent condensation in high humidity area of Firestone plant at Akron, Ohio.

Masterbatching with Latex

By IRA WILLIAMS
Research & Development Dept.,
J. M. Huber Corp.,
Borger, Texas

THE COMPOUNDING of rubber by incorporating a substance in rubber latex, followed by coagulation of the latex to trap the suspended material, is not a recent idea. The method was little used because the source of latex and compounding ingredients were usually widely separated. The production of synthetic rubber has brought the materials nearer together, increasing interest in the process as evidenced by various published articles *(1, 2)* and patents *(3)*.

The methods in common use prepare a suspension of the compounding ingredients which is then mixed with the latex. The mixture is acidified to coagulate the solids. Since the most important compounding ingredient is carbon, this method requires the preparation of carbon slurries which produce severe electrolytic corrosion of metallic equipment. The final coagulation of such mixtures of carbon slurries and latex usually requires acidification to a corrosive pH of around 3 to ensure complete precipitation.

Methods for Dispersing Carbon

Dispersion of carbon in latex would appear to offer a chance for improving the final dispersion of the carbon. This is especially true of synthetic latex, in which the particles of rubber are much smaller than in natural latex. If each particle of carbon could be completely covered with rubber while suspended in water, it would be insulated by the layer of rubber against compacting under pressure. Agglomeration of the carbon could then take place only by crowding of the carbon particles during milling. Some agglomeration is unavoidable because styrene-butadiene masterbatches containing the necessary vulcanizing ingredients will not produce worthwhile physical properties without being milled. While the carbon will hold the particles of rubber obtained from the latex, this rubber must be made to flow across the surface of the carbon to become organized *(4)*.

The dispersion of carbon in latex is favored by three conditions:

(1) The carbon must be in the finest state of division to provide the greatest available surface, since only the surface of the carbon is of value.

(2) The concentration of rubber and carbon must be as high as possible in order to increase the frequency of collision between the particles.

(3) The rubber and carbon must be brought into intimate contact under pressure.

Grinding depends on an intensity factor to produce fineness. Time of grinding is a factor only if localized intense forces are in the system and time is required to bring each particle of carbon into the localized position. Wet grinding by impact hinders building up an effective intensity factor because the particles are carried along with the liquid stream and cushioned by the liquid. A hammer mill is effective for dry grinding because the intensity factor can be increased almost as the square of the linear velocity of the hammers. The dry ground carbon can be readily incorporated directly into the latex to provide a high concentration of solids after the latex has received the necessary preparation to fulfill the third condition.

The concentration of both rubber and carbon can be kept at a maximum if dry ground carbon is incorporated directly into the latex. By this method, the carbon becomes coated with rubber and the high viscosity associated with even fairly dilute carbon black slurries is avoided.

Normal styrene rubber latex is little more viscous than water and powdered carbon cannot be satisfactorily mixed through it, even with moderately violent agitation. Even after long periods of agitation, the mixture, on standing, has the bluish white color of the latex and will coagulate in lumps because the rubber has not been picked up by the carbon. However, the viscosity of the latex can be increased by gelling agents, or better by flocculation, until the viscosity under conditions of moderately strong agitation is 40 or 50 times that of normal latex. Such latex readily folds dry carbon into its surface during agitation and the high shear produced by the viscous mass disperses the black to form a smooth slime in one or two minutes.

Flocculation may be carried out by ordinary methods. One simple method consists in the addition of a small amount of dilute sodium hydroxide followed by saturated brine. Or half saturated brine containing caustic soda may be used for part of the flocculation followed by saturated brine. Another method consists in the addition of a solution of sodium zincate. Any of these methods will produce flocculation and high viscosity without coagulation of the rubber.

Latex in this condition will readily receive most water insoluble materials. Zinc oxide disperses perfectly. Viscous oils, if heated to reduce the viscosity, incorporate immediately. As much as 40 parts of oil have been added successfully, but, particularly in the case of aromatic oils which easily swell the rubber, the system may be subject to phase inversion unless suitable precautions are taken.

Filtration and Addition of Zinc

The incorporation of the carbon black into the latex produces an almost complete coagulation to form a very fine-grained black slime. The product may be filtered at this point without the loss of either rubber or carbon. Washing to remove all flocculant completely may cause the loss of a trace of rubber

and soap. For this reason, it is advisable to add a coagulant, such as dilute sulfuric acid, alum or zinc chloride, sufficient to reduce the pH to less than 7.8. Lower pH is not required to precipitate the soaps, and the fineness of the precipitate eliminates the time factor required for diffusion in the particles to produce pH equilibrium. Since the water release from the resulting slimes is from rubber instead of carbon black, the filtration and washing is extremely rapid. The filter cake has no tendency to cling to the filter cloth. It can be removed from a drum filter as a continuous microporous sheet which dries rapidly.

Since the final pH is not low enough to dissolve zinc hydroxide, the zinc necessary for vulcanization can be added to the masterbatch. Such a procedure is desirable, especially in highly oil-extended rubbers in which zinc oxide does not disperse readily. Dry zinc oxide can be added along with the carbon. If sodium zincate is used as a flocculant, zinc hydroxide is formed when the system is treated with sulfuric acid. If a slight excess of caustic is used as flocculant, the zinc hydroxide may be formed by coagulating with zinc sulfate or chloride.

The apparatus necessary for laboratory preparation of small batches of dispersion is extremely simple. The process can be carried out in a beaker with an ordinary propeller type of agitator. However, for somewhat larger batches, a slower speed agitator which sweeps reasonably close to the bottom and a short distance up the sides of the container is preferable. A suitable container for medium-sized batches is 11 inches in diameter and 16 inches high. The stirrer is a piece of 1-inch strap iron, which lies flat 1 inch from the bottom and is turned up for 6 inches at each end 1 inch from the container wall. The speed should be variable up to about 300 rpm.

Experimental Procedure

The following is an example of the preparation of a 1710 type oil extended ISAF carbon masterbatch coagulated with a zinc salt to leave the equivalent of 4 per cent zinc oxide based on the rubber.

The container described above was charged with 6975 grams of latex containing 1500 grams of rubber at a temperature of 55°C. This was flocculated with moderate agitation by adding 480 cc of a solution containing .04 grams NaOH and 0.18 grams NaCl per cc during about 5 minutes at 55°C. It was followed by 600 cc of saturated brine added in 5 minutes. This operation could have been varied to add all of the caustic as a dilute solution, followed by the addition of the salt solution. 1020 grams of micropulverized ISAF carbon was then dumped on top of the flocculated latex; the container was covered and the agitator operated at high speed for 2 minutes. The peak load was 3.1 amperes at 115 volts which dropped rapidly to 2.4 amperes. The container was uncovered and 462.5 grams of aromatic oil heated to 100°C. was poured into the agitated mass in about 2 minutes. Next the slurry was diluted with 1350 cc of water and coagulated by quickly adding 100 grams of zinc chloride dissolved in 500 cc of water. The pH reduced to 6.6 but, after stirring for a short time, increased to 7. The smooth black slime filtered very rapidly to give a completely clear filtrate containing no zinc. After washing and drying, this stock was compounded and tested:

PHYSICAL PROPERTIES OF VULCANIZED STOCK

Min. @ 300°F.	Lbs./in.² Load at Elongation of 200%	300%	400%	Tensile	% Elongation
30	780	1520	2360	3590	565
45	890	1760	2670	3700	515
60	960	1890	2880	3690	490
75	970	1900	2910	3740	485

Masterbatch	209.5
Stearic acid	3.0
Sulfur	2.1
Santocure accelerator	1.1

Characteristics of Latex Compound

The tensile strength is somewhat higher than that obtained with a dry mix using the same rubber and the same pelletized carbon. The abrasion resistance determined with the Huber machine *(5)* shows an improvement of about 6 per cent.

The viscous latex method of compounding makes it possible efficiently to incorporate any water insoluble compounding ingredient. Hydrophobic substances such as sulfur and oils disperse readily. Suitable adjustment of the pH makes it possible to incorporate any type of accelerator, if proper account is taken of the slight water solubility of such products as mercaptobenzothiazole.

Material containing all the compounding and vulcanizing ingredients when produced in the form of a clean powder will scarcely vulcanize if pressed into a mold and heated. Some amount of mastication is necessary to bring the rubber into a vulcanizable condition. However, the uniform distribution of the rubber over the pigment and the large amount of bound rubber in the case of carbon dispersions reduce the necessary milling to a minimum. After a single pass through a small laboratory tuber, the compound vulcanizes reasonably well, and after a second pass the compound is entirely satisfactory. Equally good results have been obtained by withholding the accelerator during the precipitation and mixing the accelerator with the dried powdered masterbatch before passing it through the extruder. Such a process makes possible the elimination of the usual mixing operation for most extruded compounds.

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(3) U. S. Patent No. 2,769,795.
(4) Williams, Ira, *Rubber World*, Vol. 126, p. 362 (1952).
(5) Williams, Ira, *Rubber World*, Vol. 137, pp: 78-83 (1957).

EDITORIAL

Season's Greetings

For all molders and extruders
For all coaters and denuders

For each and every masterbatcher
For each proofer, color matcher

For every rubber pulverizer
For each and every vulcanizer

For those who work with mats or slippers
For engineers and latex dippers

For carbon black men, lab technicians
For tensile testers—electricians

For deflashers, packers, grinders
For vinyl foamers, wire winders

For rackers, stackers, cement mixers
For slitters, slicers, repairers, fixers

For each of you—in every way—

A Merry, Merry Holiday!

By JOHN D. MACOMBER
McKinsey & Company, Inc., New York, N. Y.

SPECIAL INDUSTRY REPORT

What's New in

Executive Compensation in the Rubber Industry

THE RUBBER industry was still very much in a recession period last year. Only now are many of the leading companies beginning to recapture lost volume and profits. For 1958, the rubber companies reported a 2½ per cent dip in their sales and an 8 per cent drop in profits. Other industries also felt the pressure of the recession, but not all. Eleven out of the 23 major industries surveyed enjoyed increases in both volume and profit.

The dip in volume and profits in the rubber industry reflected itself in a drop in the compensation of the chief executive officers. In fact, the decline amounted to 4.3 per cent which, compared with the changes in other industries, is a substantial one. Only four other industries—automotive parts, consumer metal products, textiles and industrial machinery—had greater declines in the compensation of their chief executive executive officers as shown in Figure 1.

Effect of Company Size

This year's study included an extensive statistical analysis of the relation of company size (measured in sales volume) to chief executive compensation. Generally, the larger a company, the more its top executive gets paid; but there is a distinct difference from industry to industry in this salary spread among companies, as shown in Figure 2. Analyzing these differences, the McKinsey survey found that the greatest spread in top executive compensation between small and large companies was in the consumer metal products and steel industries.

Each year McKinsey & Company, management consultants, conducts an annual survey of executive compensation in American industry. The 1959 survey has been broadened to include data from 791 companies and 23 major industries.

This is the third year that RUBBER AGE has published the results as they relate to the rubber industry. The data presented here are based on a financial analysis of 12 leading rubber companies, including both large and small concerns.

SUMMARY OF CHANGES IN COMPENSATION, SALES, AND PROFITS IN 23 INDUSTRIES

1958 OVER 1957

INDUSTRY	AVERAGE PERCENTAGE CHANGE		
	CHIEF EXECUTIVE COMPENSATION	INDUSTRY SALES	INDUSTRY PROFITS
Tobacco	8.0%	8.7%	19.1%
Business Machines	6.0	30.7	13.8
Public Utilities	5.9	4.9	7.9
Food	4.8	3.4	4.5
Petroleum	3.8	1.1	–19.8
Aircraft Manufacturing	3.6	– 0.8	–19.9
Personal and Household Supplies	3.2	9.7	9.7
Retail Chain Stores	2.4	6.0	2.2
Building Supplies	1.1	3.3	1.1
Air Transport	0.9	5.4	31.8
Railroads	–0.2	– 8.1	–13.9
Electrical Equipment	–1.6	– 4.3	–34.5
Department Stores	–2.3	3.2	– 0.9
Steel	–3.0	–20.0	–30.1
Chemicals	–3.7	– 4.2	–12.7
Industrial Metal Products	–4.3	– 5.2	–21.6
Nonferrous Metals	–4.3	– 7.3	–25.3
Paper	–4.3	7.9	– 7.9
Rubber	–4.3	– 2.5	– 8.0
Automotive Parts	–5.3	–14.3	–38.7
Consumer Metal Products	–5.8	– 3.3	– 5.4
Textiles	–6.3	– 4.0	–13.2
Industrial Machinery	–8.7	– 8.4	–21.3
All-industry Average	–1.8	– 3.1	–11.7
Number of Industries Recording Increases	10	11	8

FIG. 1—Compensation of chief executives in rubber ranks 19th of 23 industries in terms of improvement during the past year.

For instance, on a statistical trend line for consumer metal products manufacturers, a company with sales of $50 million would pay its top executive $72,000. A company with sales of $1 billion (20 times as large) would pay its chief executive $235,000 or 226 per cent more. On the other hand, the trend line for the air transport industry shows that the top executive of a $50 million company gets $54,000, while the the head of a $1 billion company receives $90,000 or only 60 per cent more.

The other 21 industries fall between these extremes, with rubber near the top. On the rubber industry trend line, the head of a $50 million-a-year concern earns about $68,000, and compensation rises 194 per cent to $200,000 for the chief of a company earning $1 billion.

Further, in the relatively close-knit rubber industry, company size is the main criterion for top executive pay. This is evident from the finding that 81 per cent of the variations in compensation from one rubber company to another can be explained in terms of size alone. Conversely, in industries such as electrical equipment (at the bottom of the list) less than one-half of the differences can be explained by size, other factors exerting greater influence over differing levels of chief executives' pay.

Earnings of Lower Echelons

Generally, compensation of second, third and fourth level executives fluctuates with that of the chief executives. Traditionally, the compensation of the next three highest echelons of management in the rubber industry has been slightly above their counterparts in industry as a whole. Now the others are catching up to, and in some cases passing, rubber executives.

As shown in Figure 3, the compensation of the second, third and fourth men in all industries as a percentage of the chief executives' compensation is at least equal to, and in one case greater than, rubber industry salaries. This is the first time in three years that the executives in the rubber industry have not been notably ahead of the other industry executives.

Summary

Summarizing the major points from our survey this year as it relates to the rubber industry, we can say:

(1) For the first time since the McKinsey survey was initiated in 1955, an immediate dip in profits resulted in an immediate decline in compensation of the rubber chief executives.

(2) The size of the enterprise has a greater influence on the compensation of rubber chief executives than in most other industries.

(3) The second, third and fourth highest-paid executives in the rubber industry no longer enjoy the important compensation advantage that they once had over their all-industry counterparts.

COMPENSATION OF CHIEF EXECUTIVES AT SELECTED POINTS ON THEIR INDUSTRY TREND LINE

INDUSTRY	COMPENSATION IN COMPANIES ACCORDING TO SIZE (Net Sales) AT $50 MILLION (000 Omitted)	AT $500 MILLION (000 Omitted)	AT $1 BILLION (000 Omitted)
Personal and Household Supplies	$82	$202	$265
Steel	75	190	250
Consumer Metal Products	72	180	235
Business Machines	85	185	235
Nonferrous Metals	78	171	218
Tobacco	84	174	217
Chemicals	71	162	210
Textiles	70	163	210
Rubber	68	155	200
Building	74	158	195
Paper	64	137	170
Industrial Metal Products	77	140	170
Oil	76	140	170
Automotive Parts	76	140	170
Aircraft Manufacturers	76	137	163
Industrial Machinery	71	132	160
Electrical Equipment	69	130	155
Public Utilities	66	124	152
Railroads	59	122	151
Department Stores	70	125	148
Retail Chain Stores	56	118	148
Food	60	111	134
Air Transport	54	81	91
Trend Line for all 791 Companies	$71	$147	$188

FIG. 2—Top rubber executives' pay ranks 9th among 23 industries, listed in descending order of compensation for companies with net sales of $1 billion.

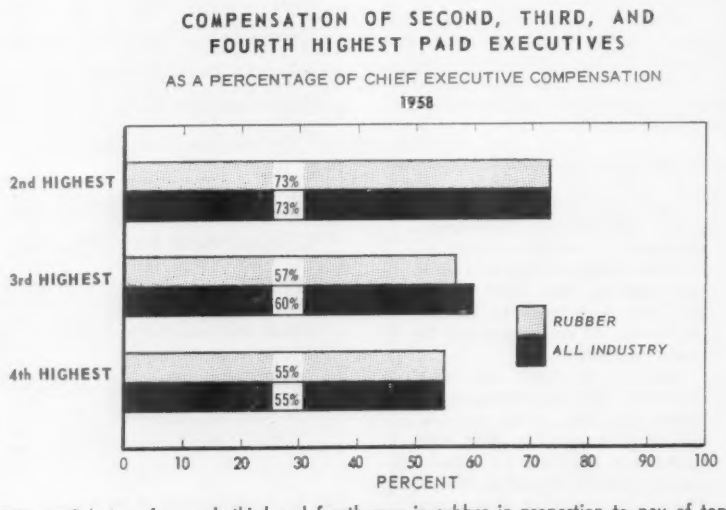


FIG. 3—Salaries of second, third and fourth men in rubber in proportion to pay of top officials is virtually the same as for industry as a whole.

International Rubber Conference Held

November 8-13 Meeting in Washington, D. C. Features 70 Technical Papers and Exhibits

► Approximately 1,565 members and guests were in attendance at the International Rubber Conference held on November 8 to 13 at the Shoreham and Sheraton-Park Hotels in Washington, D. C., including 153 foreign delegates and 133 women registrants. The five-day meeting featured the presentation of some 70 technical papers arranged into 12 technical sessions. The meeting also featured a series of exhibits pertaining to instruments, processing equipment, raw materials and publications. All exhibits were housed in the Grand Ballroom of the Shoreham Hotel. Technical sessions were also held at the Shoreham. A Supplier's Cocktail Party and a banquet were held at the Sheraton-Park Hotel.

The International Rubber Conference was co-sponsored by the Division of Rubber Chemistry, American Chemical Society; Committee D-11 on Rubber and Rubberlike Materials of the American Society for Testing Materials, and the Rubber and Plastics Division of the American Society of Mechanical Engineers.

Welcoming Address

The conference got under way on Monday, November 9, with introductory and welcoming remarks by Wallace R. Brode, Science Advisor to the Secretary of State, U. S. Department of State. The first technical session began immediately thereafter with R. D. Stiehler (Bureau of Standards) as chairman. Dr. Stiehler is chairman of the ASME Rubber and Plastics Division. This session was devoted to "Equipment and Processes in Rubber Manufacturing."

The afternoon session on November 9 was devoted to the subject of "Tires" and was chaired by R. G. Seaman (*Rubber World*). S. Collier (Johns-Manville, retired), Chairman of ASTM Committee D-11, served as chairman of the second session on "Tires" which was held on Tuesday morning, November 10. The afternoon of November 10 was held open so that those attending the conference might visit historic Washington sites or take in conference tours including the National Bureau of Standards and the Bureau of Engraving and Printing.

The technical sessions resumed on Wednesday morning, November 11. E. H. Krismann (DuPont), chairman of the ACS Division of Rubber Chemistry, served as chairman of a session devoted to papers on "Aging," as well as another on the subject of "Sealants." Concurrent sessions held on Wednesday morning included another session on "Tires" chaired by H. G. Bimmerman (DuPont), vice-chairman of ASTM Committee D-11, and one on "Advances in Test Methods," also chaired by Mr. Bimmerman.

On Wednesday afternoon, November 11, the session was devoted to three subjects, i.e., "Advances in Test Methods;" "Classification of Compounds," and "Statistical Methods." This session was chaired by J. J. Allen (Firestone), secretary of ASTM Committee D-11.

On Thursday morning, November 12, A. W. Sloan (Atlantic Research) chaired a session on "Natural Rubber and Latex." A concurrent session on Thursday morning, presided over by J. H. Ingmanson (Whitney Blake) was devoted to papers on "Theory."

Three subjects were covered on Thursday afternoon, one after the other. W. J. Sparks (Esso Research), served as chairman of this session which included papers on "Adhesion," "Synthetic Rubber Latex," and "Latex Modified Rubbers." A concurrent session on Thursday afternoon, devoted to "Elastomer Reinforcement," was chaired by Dr. B. S. Garvey, Jr. (Pennsalt Chemicals).

Papers on "Polymers and Polymer Structure" were heard at a session on Friday morning, November 13, presided over by Dr. R. F. Dunbrook (Firestone). The final session on Friday afternoon was presided over by Dr. A. E. Juve (Goodrich Research). This session was devoted to papers on the the subject of "Vulcanization."

Abstracts of all the papers presented at the International Rubber Conference were published in the July, 1959, issue of RUBBER AGE. Last minute additions to the program were abstracted in the October, 1959, issue. Readers interested in papers presented at the conference are referred to these two issues for further information.

Conference Exhibits

A special feature at the International Rubber Conference was an exhibition of raw materials, rubber processing machinery, testing and control equipment, and publications. Twenty-two organizations participated in the exhibition which was held in the Shoreham Hotel

R. D. Stiehler

R. G. Seaman

S. Collier

ballroom under the direction of Dr. Norman Bekkedahl (Bureau of Standards). Over 1,000 persons visited the exhibition which opened on Tuesday morning, November 10, and closed at noon, Friday, November 13. The exhibits either featured a specific new item or presented a company's general line.

The American Instrument Co., Inc., Silver Spring, Md., featured two items at its booth, a sub-zero test cabinet and a plastic deflection tester. Temperatures in the cabinet range from —100°F. to +220°F. The deflection tester indicates the deflection of thermoplastics when subjected to various loads and temperatures.

The American Society for Testing Materials, Philadelphia, Penna., displayed samples of its many publications and distributed the "ASTM Bulletin" and a list of its current publications. The American Society of Mechanical Engineers, New York, N. Y., also featured its publications and distributed its 1960 list of publications.

A tensile and compression tester, designated FRL Environmental Test Chamber, Model CS-90, was shown by Custom Scientific Instruments, Inc., Kearney, N. J. The temperature range of this unit is —90°F. to +750°F. and it contains such features as a dry ice container, heaters and blowers.

Emerson Apparatus Co., Melrose, Mass., displayed three pieces of equipment for use in the laboratory as rubber testing apparatus. The equipment included a buffing machine designed for buffing samples of rubber to absolutely uniform thickness; a Ross rubber flexing machine intended for use in determining the resistance of vulcanized compounds of rubber or synthetic elastomers; and a water bath designed for accelerated aging of rubber or rubber compounds.

The applications of butyl rubber were featured by Enjay Co., New York, N. Y. This exhibit showed such typical uses of butyl as automotive parts, electrical insulation, chemical resistant clothing, proofed goods, inflatable goods, adhesive and caulking compounds, and seals.

Farrel-Birmingham Co., Inc., Ansonia, Conn., featured the Banbury mixer. With pictures and scale models, the design, development and changes of the Banbury over the past 43 years was shown. A photograph of Dr. F. H. Banbury, recipient of the Goodyear Medal during the conference, was on display.

The exhibit of Firestone Synthetic Rubber & Latex Co., Akron, Ohio, featured bouncing rubber balls which served to show the rebound qualities of different synthetic and natural rubber compounds. This display contained a world map background which pinpointed the company's world-wide factories, distributors, plantations and synthetic rubber plants.

Two rubber deflashing units were shown by the Liquid Carbonics Division of General Dynamics, Chicago, Ill. One unit used nitrogen to trim silicone rubber parts, while the other unit used carbon dioxide.

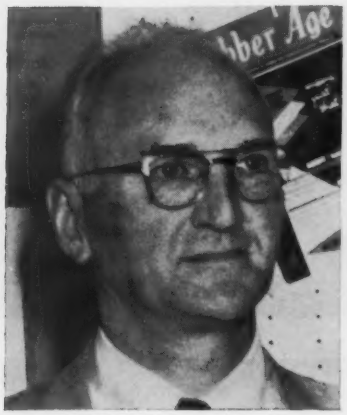
Synthetic rubber was highlighted at the exhibit of Goodyear Tire & Rubber Co., Akron, Ohio. Displayed against a background of a flow chart showing a typical styrene rubber processing plant, were samples and packages of several synthetic rubber compounds including Plioflex 1712, 1713, and 1006.

The exhibit of Scott Testers, Inc., Providence, R. I., featured and demonstrated the firm's new Model CRE tensile elongation tester. Also on display

H. G. Bimmerman

E. H. Krismann

J. J. Allen



A. W. Sloan

J. H. Ingmanson

B. S. Garvey, Jr.

was a complete range of Scott's clamps and fixtures. The company also demonstrated its aluminum block heating bath and pressure aging oven for rubber.

Instron Engineering Corp., Canton, Mass., displayed its tensile tester which demonstrated and recorded force deflection curves at a wide variety of test conditions of load and speed.

Standard rubber and rubber compounding materials were described at the National Bureau of Standards booth. A series of mounted photographs depicted the Bureau's methods of physical measurement.

The display of Naugatuck Chemical Division of U. S. Rubber Co., Naugatuck, Conn., highlighted a map showing its foreign and domestic plants as well as world wide distribution locations. The exhibit featured a metering pump, developed by Thayer Scale Co., Pembroke, Mass., which accurately measures and dispenses small amounts of liquids.

An automatically controlled ozone test chamber, designated Orec 0300, was the featured item at the booth of Ozone Research and Equipment Co., Phoenix, Ariz. This unit is an electronic-chemical loop feed back servo system which is employed for the control of ozone concentrations in a confined space. Also shown was a dynameter used for dynamic flexing of rubber samples.

Palmerton Publishing Co., Inc., New York, N. Y., publishers of RUBBER AGE., RUBBER RED BOOK and ADHESIVES AGE, displayed these publications as well as other magazines and books which it distributes. In all some 22 magazine and books were shown as well as the "Rubber Formulary," a monthly compounding service. Literature on all the books, magazines and services was available.

Cis-4 polybutadiene was the featured item at the display of Phillips Chemical Co., Akron, Ohio. Bouncing balls compared the resiliency of *Cis*-4 with natural rubber and a world map pointed out the international operations of Phillips.

The booth of Reliable Rubber & Plastic Machinery Co., Inc., North Bergen, N. J., featured the company's 6x13 laboratory mill. A brochure describing the mill's features was distributed.

Automation in the rubber industry was the theme of the exhibit of Richardson Scale Co., Clifton, N. J. The company demonstrated its Formula Capsule and Punch Card Select-O-Weigh systems.

Representatives of Science Sales International, Inc., New York, N. Y., manned the company's booth and answered questions about the firm. It was stressed that the company features representation, procurement, consultation and negotiation of anything scientific anywhere in the world.

The Shore Durometer was the highlighted unit on display at the booth of Shore Instrument and Mfg. Co., Inc., Jamaica, N. Y. Featured in the booth was the Durocalibrater, a unit designed for calibrating Shore Durometers.

Testing Machines, Inc., Mineola, N. Y., displayed and demonstrated several testing machines handled by the company. Among the units shown were the Shawbury Curometer, Wallace Rapid Plastimeter and Wallace Rubber Micro Hardness Tester.

The good reception the exhibition was given by both the exhibitors and the delegates gives indication that similar exhibitions may be planned for future Rubber Division meetings.

W. J. Sparks

R. F. Dunbrook

A. E. Juve

INTERNATIONAL RUBBER

CONFERENCE EXHIBITS

Business Meeting

The business meeting of the ACS Rubber Division was held on Wednesday morning, November 11, immediately preceding the Charles Goodyear Medal address by Dr. Fernley H. Banbury. Members in attendance first observed a minute of silence for those who passed away since the last meeting including John T. Cox, K. E. Kress and A. A. Somerville. Two proposed amendments to the by-laws were presented to the members. The purpose of one amendment is to elect one third of the directors each year for a three-year term for better continuity instead of one-half of the directors for a two-year term. This amendment was passed by a voice vote.

The second amendment under consideration concerned itself with a change in Article VII on elections providing that the Chairman shall, prior to February 1, appoint a Nominating Committee which shall submit to the Secretary by April 1 a slate of officers and directors. This amendment was also passed by a voice vote.

C. V. Lundberg (Bell Telephone Laboratories), on behalf of the Tellers Committee then announced the results of the letter ballot for officers and directors of the group. The new officers are: *Chairman*—W. J. Sparks (Esso Research); *Vice-Chairman*—W. S. Coe (U. S. Rubber); *Secretary*—Roscoe Gerke (U. S. Rubber); and *Treasurer*—George E. Popp (Phillips Chemical). The following members have been elected as directors for two-year terms representing the rubber groups or area indicated: *Northern California*—N. R. Legge (Shell Development); *Connecticut*—R. T. Zimmerman (R. T. Vanderbilt); *Detroit*—R. H. Snyder (U. S. Rubber); *Southern Ohio*—D. A. Meyer (Dayton Rubber); *Philadelphia*—R. A. Garrett (Armstrong Cork); *Rhode Island*—R. W. Szulik (Acushnet Process); *Southern*—J. M. Bolt (Naugatuck Chemical); *Washington*—A. T. McPherson (Bureau of Standards).

The newly elected chairman, Dr. Sparks, then presented a Certificate of Award to Past-Chairman E. H. Krismann (DuPont) for his services to the Rubber Division during his term of office. Mr. Krismann thanked all division members for their cooperation during his tenure in office.

As one of his last acts in office, Mr. Krismann announced that the Best Paper Award for the preceding meeting of the Rubber Division had been won by the paper entitled "Chemical Inhibition of Ozone Degradation of SBR" by H. W. Kilbourne, G. R. Wilder, J. E. Van Werth and J. O. Harris, all of the Organic Chemicals Division, Monsanto Chemical Co., Nitro, West Va. Mr. Harris, acting on behalf of all the authors, accepted the award. Each of the authors will receive an appropriate document signifying the award.

It was also announced at the meeting that W. B. Wiegand, who retired in 1951 as vice-president of the Columbian Carbon Co., has been selected as the Goodyear Medalist for 1960. A complete biography of Dr. Wiegand appears elsewhere in this issue. Dr. Wiegand will deliver his Goodyear Lecture at the forthcoming meeting of the Rubber Division in Buffalo, N. Y.

The feature of the session on Wednesday morning, November 11, was the presentation of the Charles Goodyear Medal address by Dr. Banbury. Dr. Banbury was introduced by Mr. Krismann. The Goodyear Medal Lecture was devoted to the subject, "People and the Banbury."

Traces Banbury Development

Dr. Banbury, in his address, traced the development of the Banbury Mixer, recounting some of his early experiences and the manner in which his development reached its present standing in the industry. He paid tribute to his early associates, H. F. Wanning and F. D. Wanning of the old Birmingham Iron Foundry of Derby, Conn., the company which, when joined with the Farrel Foundry and Machine Co. of Ansonia, Conn., became the Farrel-Birmingham Co., Inc., we know today.

In relating some of his early experiences, Dr. Banbury described the early Banbury Mixers and their capacities

and went on to show how these early models were improved upon. Primarily, however, he concerned himself with the people who helped establish the Banbury Mixer commercially in industry.

Other Activities

Other activities reported during the meeting included forthcoming meetings of the Rubber Division (see table elsewhere in this issue) and a report by Guido H. Stempel (General Tire), chairman of the Library Committee. Mr. Stempel advised that Mrs. Patricia Dreyfuss has been engaged as librarian at the Rubber Division Library at the University of Akron on a part-time basis since Mrs. Lillian Cook, former librarian, has resigned.

John McGavack, chairman of the Bibliography Committee, reported that work on future editions of the "Bibliography of Rubber Literature" covering the years 1952-54, 1955-56, and 1957-58 is proceeding, with 1952-54 edition to be published shortly and the 1955-56 edition to be published in Spring, 1960.

Dr. Sparks reported on plans which have been going forward for the Spring, 1960 meeting of the Rubber Division which will be held in Buffalo. For the Fall, 1960 meeting, arrangements are in progress for a joint symposium with the Oil, Paint and Varnish Division of ACS. Another joint meeting, this one with the Petroleum Division, has been proposed for the Fall Meeting in 1961. The symposium would concern itself with elastomers.

Mr. Sparks also indicated that an effort is being made to introduce somewhat more of an academic atmosphere in future meetings. To that end, invitations have been extended to several persons for the Spring Meeting in Buffalo. Persons invited and subjects suggested include: Herman Mark (Brooklyn Polytechnic), "Recent Advances in Rubber Chemistry;" Carl S. Marvel (Illinois University), "Advances in Polymerization Chemistry;" Warren K. Lewis (M.I.T.), "Forty Years of Chemical Engineering in the Rubber Industry," and Peter Debye (Cornell University), "Fundamentals of Rubber-like Behavior."

25-Year Club Luncheon

The 25-Year Club luncheon held at 12:30 P.M. on Wednesday, November 11, attracted 203 members and guests. The luncheon was preceded by a reception. Attendance rules were waived for the luncheon so that foreign delegates in attendance at the conference could participate. The luncheon meeting was chaired by C. A. Bartle (DuPont), who first introduced new members and the foreign visitors.

Members and guests observed a minute of silence for club members who had passed away since the last meeting including A. A. Somerville, Theodore Cowan and Sherman Doner. A vote of thanks was tendered to H. A. Winkelmann (Dryden Rubber), chairman of the Steering Committee, and to E. Busenberg (Xylos Rubber), secretary-treasurer, for their activities on behalf of the organization.

Dr. Winkelmann presided over the selection of the member in attendance with the most rubber industry service. Irving Laurie (Laurie Rubber Reclaiming) was adjudged the winner with more than 49 years of service.

W. J. Sparks (left), newly-elected chairman of the A.C.S. Rubber Division, presents a Certificate of Award to retiring chairman E. H. Krismann.

At the banquet, Mr. Krismann is observed conversing with banquet speaker Dr. Howard A. Wilcox.

Mr. Krismann (left) presents a scroll to Goodyear Medalist Dr. F. H. Banbury (right) as Dr. R. F. Dunbrook looks on.

Mr. Laurie, owner and general manager of the Laurie Rubber Reclaiming Co., New Brunswick, N. J., is a director of the Rubber Reclaimers Association and a member of the New York, Philadelphia and Connecticut Rubber Groups. He has been general manager of Laurie Rubber Reclaiming since 1918 following service with the U.S. Army in World War I. The company which he now heads was founded in 1910.

Members of the Soviet delegation visit the Palmerton Publishing Co. exhibit. Seen second from the left is A. P. Bogayevski, editor-in-chief of "Soviet Rubber Technology."

It was announced that C. H. Peterson (U. S. Rubber Reclaiming) will serve as chairman of the 25-Year Club Luncheon which will be held in conjunction with the Spring, 1960 meeting of the Division of Rubber Chemistry in Buffalo, while John M. Ball (Midwest Rubber Reclaiming), will serve in a similar capacity at the Fall, 1960 meeting in New York City.

Conference Banquet

The International Rubber Conference Banquet was held on Thursday evening, November 12, immediately following a Supplier's Cocktail Party to which all registrants and their wives were invited. Both the Supplier's Cocktail Party and the banquet were held in the Sheraton-Park Hotel. Approximately 730 members and guests attended the banquet.

A. E. Juve (Goodrich Research), chairman of the conference, delivered introductory remarks and welcomed foreign guests. Dr. Juve also introduced those sitting on the dais including the representatives from the three sponsoring societies and delegates representing some of the foreign groups attending.

J. M. Buist of England, speaking on behalf of all the foreign delegates, thanked his American hosts and particularly American industry for their open-handedness in revealing processes and equipment to all.

Dr. Juve then expressed gratitude on behalf of the International Rubber Conference to the Institution of the Rubber Industry for deferring its 1959 Conference to 1962 so that the International Rubber Conference could be held this year in the United States.

Sidney Sutton (Veedip), next addressed the group on behalf of the British delegation. Mr. Sutton relayed greetings from Sir John Dean, president of the Institution of the Rubber Industry and went on to suggest the merits of an international diploma in rubber chemistry. Mr. Sutton extended an invitation to all present to attend the International Rubber Conference which will be held in London, England, in May of 1962.

Dr. Fromandi, chairman of the German Rubber Society, spoke next, announcing a rubber conference which will be held on October 4 to 7, 1960, in West Berlin. He too extended an invitation to all to attend the conference which will feature an exhibition on man-made fibers used in the rubber industry.

Dr. Juve then commended the Local Arrangements Committee for the excellent work it had done in arranging for the International Rubber Conference. He particularly cited Dr. B. S. Garvey, Jr. (Pennsalt Chemicals), Chairman of the Program Committee, and Robert Seaman *(Rubber World)* for arranging for the preprint of conference papers. He also thanked R. D. Stiehler (Bureau of Standards) for his efforts on behalf of the conference.

Mr. Krismann then introduced Dr. Harry L. Fisher, past-chairman of the American Chemical Society, who delivered an address on the life of the Goodyear Medalist, Dr. Banbury. Dr. Fisher described the medalist's early life in England, his coming to the United States, and his activities in developing the internal mixer which bears his name.

Dr. R. F. Dunbrook (Firestone), chairman of the Goodyear Medal Committee, then presented Dr. Banbury to the audience. Mr. Krismann, on behalf of the Rubber Division, presented Dr. Banbury with a scroll in recognition of the honor; a gold medal, and a check for $200. Dr. Banbury in brief remarks thanked all present for the honor which had been accorded him.

Mr. Krismann then introduced the featured speaker for the banquet, Dr. Howard A. Wilcox, Deputy Director, Research and Engineering, Department of Defense, who spoke on "Future Prospects." In his address, the speaker discussed some future technological possibilities (and some impossibilities), together with speculations regarding various possible social adjustments to these developments. He considered the impact of unlimited energy under man's control; world population; and the possible course of future internal struggles.

Following Dr. Wilcox's address, Mr. Krismann, in his last official act as retiring chairman of the Rubber Division, thanked all members for their cooperation with him during his term of office. He then declared the banquet adjourned.

Newly-elected officers of the A. C. S. Rubber Division include (left-to-right): Dr. R. H. Gerke (secretary); G. E. Popp (treasurer); W. J. Sparks (chairman), and W. S. Coe (vice-chairman).

Ladies' Activities

A full range of activities were scheduled for the ladies in attendance at the meeting. A special headquarters and hospitality room were established and ladies were able to participate in a number of tours of historic Washington sites including a special tour of the White House and various embassies. A fashion show was also provided.

Responsible Committees

In a meeting as varied and complex as the International Rubber Conference, many individuals and organizations had to perform herculean tasks to assure that all would run smoothly. The Administrative Committee for the entire conference functioned under the chairmanship of A. E. Juve (Goodrich Research) with J. J. Allen (Firestone) as secretary. Other Administrative Committee members included H. G. Bimmerman (DuPont), G. L. Bruggemeier (Firestone), Simon Collier (Johns-Manville-retired), B. S. Garvey, Jr. (Pennsalt Chemicals), R. G. Seaman *(Rubber World)*, A. W. Sloan (Atlantic Research) and R. D. Stiehler (Bureau of Standards).

The Program Committee was chaired by Dr. Garvey and included Mr. Bruggemeier, O. D. Cole (Firestone), C. F. Gibbs (Goodrich), J. D. D'Ianni (Goodyear), M. E. Lerner (RUBBER AGE), G. C. Maassen (R. T. Vanderbilt), R. G. Seaman *(Rubber World)*, Dr. Stiehler and W. F. Tuley (Naugatuck Chemical).

The Committee on Local Arrangements was headed by A. W. Sloan and included the following persons who arranged for the activities noted: *Exhibits* —N. Bekkedahl (Bureau of Standards); *Plant Trips and Transportation*—H. C. Bugbee (National Rubber Bureau); *Registration*—E. A. Bukzin (Bureau of Ships); *Ladies' Entertainment*—C. R. Collins; *Finance* — G. W. Flanagan (Goodrich Chemical); *Transportation*— R. H. Mattson; *Publicity*—G. B. Krantz (Journal of Commerce); *Banquet*—W. J. Sears (RMA); *Housing and Hotels* —R. F. Tener (Bureau of Standards). Dr. Stiehler served as consultant to the Local Committee on Arrangements.

Each of the persons who chaired individual groups within the Local Arrangements Committee was assisted by many other individuals. A total of 18 people, for example, served on the Housing and Hotels Committee. Each of these individuals contributed in no small measure to make the International Rubber Conference a success.

Stewart Bolling Promotes Grimm

► J. George Grimm has been elected vice-president in charge of sales for Stewart Bolling & Co., Inc., Cleveland, Ohio. Mr. Grimm, who has been with the firm for 15 years, was formerly general sales manager.

Future Meetings of the Division of Rubber Chemistry American Chemical Society

Date	*Place*	*Hotel*
May 3-6, 1960	Buffalo, N. Y.	Statler
Sept. 13-16, 1960	New York, N. Y.	Commodore
Apr. 18-21, 1961	Louisville, Ky.	Brown
Sept. 5-8, 1961	Chicago, Ill.	Sherman
Apr. 24-27, 1962	Boston, Mass.	Statler
Oct. 16-19, 1962	Cleveland, Ohio	Cleveland
May 7-10, 1963	Toronto, Canada	Royal York
Sept. 10-13, 1963	New York, N. Y.	Commodore
Apr. 28-May 1, 1964	Detroit, Mich.	Cadillac
Sept. 1-4, 1964	Chicago, Ill.	Sherman
Sept. 14-17, 1965	Atlantic City, N. J.	Chalfonte
May 3-6, 1966	San Francisco, Calif.	Fairmount
Spring, 1967	Montreal, Canada	Queen Elizabeth
Sept. 12-15, 1967	Chicago, Ill.	Sherman

Begins Sale of Stockpile Rubber

► Government sales of crude natural rubber from the national stockpile totaled 5,796 long tons during October, the General Services Administration has reported. G. S. A. plans to sell about 50,000 tons of rubber from the stockpile this year. Previously, this rubber was rotated to prevent deterioation. However, Congress recently authorized G. S. A. to sell perishable materials from the stockpile without replacing them.

The government ruled that some 470,000 long tons of government-held rubber should be sold because it is no longer needed in the emergency stockpile. The government plans to sell 40,000 to 50,000 long tons of rubber annually for the next nine years. The first rubber disposal action began on October 16. G. S. A. said future sales figures would be made available monthly. Rubber sales, officials stated, are made on the basis of prevailing market prices.

Celebrates 50th Anniversary

► The firm of Guix Sociedad Anonima of Cornella, Barcelona, Spain, internationally known manufacturers of rubber machinery and equipment, is currenily celebrating its fiftieth anniversary. In connection with its "Golden Wedding," the company has issued a most attractive brochure outlining its varied activities. The brochure not only details the history of the company, but also includes data on its varied line of equipment and depicts installations made over the past fifty years in numerous countries. The Guix family is still in control of the organization. Copies of the brochure are available on request to the company.

Phillips Plans Carbon Black Unit

► Phillips Chemical Co., Bartlesville, Okla., has announced that a new 60 million pound per year carbon black plant will be erected four miles northeast of Orange, Texas. The facility is expected to help meet the growing demand for carbon black. Plant design has been completed and purchase of materials and equipment is underway. Completion is scheduled for the third quarter of 1960. Phillips is also joining an Italian company, Anic, S. P. A., to erect a plant in Italy with an initial capacity of 25 million pounds a year of oil blacks. The facility, which will utilize a process Phillips perfected in 1942, is scheduled to be in production in two years. The American firm is constructing other carbon black plants in France and South Africa in partnership with companies of these two countries.

Goodyear Splits Stock

► Directors of the Goodyear Tire & Rubber Co., Akron, Ohio, have authorized a three-for-one stock split, a 12½ per cent increase in the cash dividend on the common stock and a 2 per cent stock dividend on the split shares. Directors declared a quarterly payment of 67½c per share on the present shares, payable December 15 to stockholders of record November 16. This compares with 60c previously paid and is equivalent to 22½c on the split shares. On an annual basis, this will be at the rate of 90c on the new shares, or $2.70 on the present stock against $2.40 per share paid in recent years. The stock split was accomplished by issuing two additional shares to stockholders of record November 16 for each share held on that date.

RMA Holds 44th Annual Meeting

200 Gather to Hear Vila and Hathway; Romulo Featured Luncheon Speaker

► Some 200 rubber industry leaders were in attendance at the 44th Annual Meeting of the Rubber Manufacturers Association, Inc., held on November 20 at the Park Lane Hotel in New York City. The program for the meeting featured introductory remarks by Ross R. Ormsby, president of RMA, followed by a talk by George R. Vila, group vice-president of the U. S. Rubber Co. Mr. Vila spoke on "Economic Trends in Rubber and the Newer Rubberlike Materials." Following Mr. Vila's address, Earl B. Hathaway, sales vice-president of the Firestone Tire & Rubber Co., spoke on "The Marketing Outlook for Rubber in 1960."

The program continued with a panel discussion on the "Legislative Impact on Business." Panel members included Congressman William H. Ayres (Rep., Ohio), and Stephen F. Dunn, vice-president, government relations, National Association of Manufacturers. A third panel member, Paul Hencke, associate editor of *Nation's Business*, was taken ill and was unable to participate in the panel discussion. W. J. Sears, vice-president of RMA served as panel moderator.

The panel session was followed by a reception and by a luncheon. General Carlos P. Romulo, Philippine Ambassador to the United States, was the featured luncheon speaker.

Election Results

Pierce Sperry (Sperry Rubber) and J. E. Trainer (Firestone) were elected to the RMA board of directors at the meeting with terms expiring in 1962. Re-elected for the same term were: Thomas Robins, Jr. (Hewitt-Robins), J. H. Matthews (Raybestos - Manhattan), J. P. Seiberling (Seiberling), and J. W. McGovern (U. S. Rubber). Arthur Kelly, executive vice-president of the B. F. Goodrich Co., has been elected a director for a term expiring in November, 1960, succeeding John L. Collyer, chairman of the board of B. F. Goodrich.

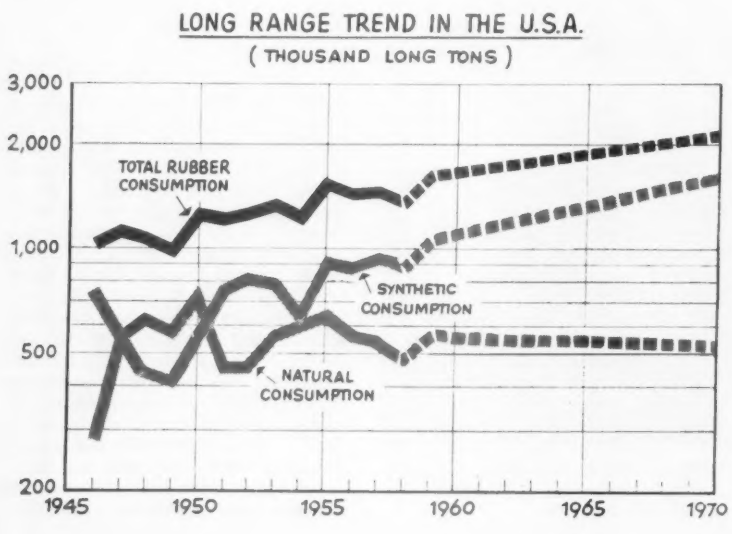
In his remarks, Mr. Ormsby stated that there is no such thing as a rubber industry pattern on collective bargaining and there should not be. "There is no secret," he said, "about the manner in which collective bargaining, and particularly negotiations on wages, are conducted in our industry. The Union generally selects one of the major rubber companies as a pattern-setter, and after an agreement is reached, indicates that this pattern should be followed by all other rubber companies. There is no such thing as a rubber industry pattern on collective bargaining and there should not be.

"Our industry manufactures more than 40,000 rubber products. The economics of producing tires as against producing molded and extruded items — heels and soles — rubber sundries — rubber footwear and many others—is as different as day is from night. The rubber manufacturing industry is made up of several industries using a common raw material and if all the segments of the rubber industry are to grow and expand and provide more jobs and better jobs—responsible Union leadership must recognize the economic facts of life as they vary among the separate branches of the rubber industry."

Reviewing the industry's industrial relations problems over the past year, Mr. Ormsby recalled that "Many of our companies negotiated in 1959 on general contract issues, pensions and insurance agreements and then, later in the year, on wages. This means that in several instances companies in the rubber manufacturing industry were subject to a series of strike exposures during the course of a single year.

"A short time after the settlement of some of our lengthy strikes this past spring on pensions, insurance and contract issues, it was announced that these same companies would now commence bargaining with the Union on wages. We had calls at the RMA from representatives of other industries wanting to know what was going on—and why we were starting to bargain again so soon on other issues," Mr. Ormsby said.

"Obviously, this is not an efficient way to run a business—it is not in the best interests of our employees, our customers, our stockholders. These prolonged series of negotiations are expensive to both management and the Union. For a considerable period of time, companies in our industry have attempted to consolidate these bargaining sessions, but the Union



has thought otherwise. Union leaders should cooperate with our individual companies in bringing about one set of negotiations in which all of these matters can be settled when they are properly open for collective bargaining."

Mr. Ormsby pointed out that "The lengthy strikes which occurred in our industry last spring involved non-wage issues. This was unfortunate, because for several years, many of our companies had already granted expensive benefit programs including liberal pension plans, group hospitalization and medical insurance for the employee and his family—group life insurance and sickness and accident plans for the employee—all paid for by the company. In addition, many companies pay for group hospitalization and life insurance for the employee after he has retired on pension. These non-wage benefit programs are more expensive to our companies than those existing today in the automobile, steel, and electrical industries."

Mr. Ormsby also traced developments in connection with the government's recent decision to dispose of about 470,000 long tons of rubber deemed to be in excess of security needs. He recalled that the industry has believed for some time "that the strategic stockpile of natural . . . was too large and that a burdensome surplus was being maintained to the detriment of the American taxpayer." He said the Government had been advised of the industry's views taking full recognition of the fact of the Government's obligation "to foreign producing countries and the fact that our stockpile law stipulates that disposal of surplus stockpile materials must be accomplished with a minimum market effect. . . . "

He said that "An orderly, definite and publicly-stated plan for disposal of surplus rubber from the government's stockpile will not only effect a savings to the taxpayer, but will be in the long-term interest of both producers and consumers of natural rubber."

Discusses Economic Trends

Mr. Vila, in his talk on "Economic Trends in Rubber and the Newer Rubberlike Materials," estimated that 1,620,000 long tons of new rubber will be consumed in 1959 and even more will be consumed in 1960.

Mr. Vila told the rubber executives attending the meeting that during 1959, America's big, fast-moving rubber industry would consume "over 3.5 billion pounds of rubber, including natural and synthetic varieties; nearly 1 billion pounds of textiles, including cotton, rayon and nylon, and over 1 billion pounds of chemicals, including fillers, curatives and stabilizers," and said that much of the industry's "present vigor stems from this vast array of raw materials as the combinations and permutations possible are virtually endless."

Mr. Vila predicted that world production of synthetic rubber will more than double in the next 10 years and said that natural rubber output would remain at about its present level. By 1970, he said, world-wide rubber consumption would rise by two-thirds above present levels to about 7½ million tons a year. With world demand increasing, "the gap obviously must be closed by synthetic rubber, which appears destined to more than double during this same period," Mr. Vila said.

Noting that by 1970 the U.S.A. would have 2,000,000 tons of synthetic rubber capacity to meet an annual demand in the order of 1,700,000 tons, he said, "It would appear that American producers have planned boldly; hence, rubber processors seem assured of more than adequate supplies with a substantial surplus available for export. This surplus neatly hedges against possible delays in Soviet bloc production, or a breakdown in supplies of natural rubber from Indonesia."

Mr. Vila estimated that by 1970 world production of synthetic rubber will be more than four million tons, with natural rubber holding only a third of the rubber market by that time.

Mr. Vila reported that some of the industry's new "stereo-regular" rubbers, made possible by an impressive breakthrough in technology, "are replacing natural rubber in applications such as heavy duty tires; others will undoubtedly make a strong bid to take a share of present SBR outlets as the new polymerization techniques challenge established emulsion methods.

"Urethane is also advancing, principally in the foam rubber market where it competes with natural and SBR latices. Another outlet for this material is the field of mechanical specialties where its unique properties of high abrasion, strength and oil resistance can be employed to advantage. Still another potential is rubber thread.

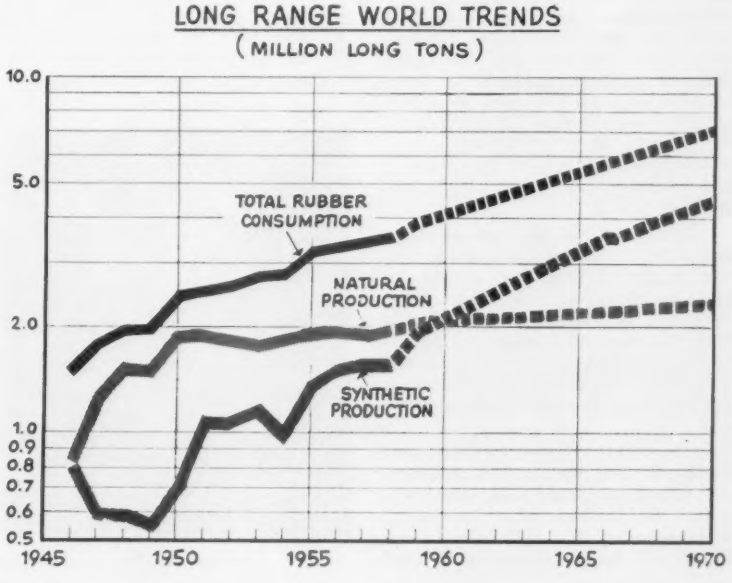
"Researchers are now trying to find solutions for its relatively poor low-temperature performance and moisture sensitivity. When, and if, breakthroughs occur the industry might have a super rubber which could revolutionize many engineering and design concepts, particularly in the field of abrasion resistance. The liquid form of this material could also have tremendous impact on manufacturing techniques that lend themselves to a high degree of automation," Mr. Vila said.

He referred to many advances in polymer chemistry and stated "It is likely that the hazy line now separating plastics from rubber will be completely erased. In this area, the rubber manufacturer will have at his command an ever-widening array of raw materials and a degree of versatility he has not previously known."

The "Selling Sixties"

Mr. Hathaway, in his talk, asserted that rubber manufacturers face in the "Selling 60's" a decade of exciting challenge that will test the industry's distribution and marketing techniques as they have never been tested before. "The challenge of the 60's, like the challenge of 1960, arises directly from the character of the period through which we have recently been going.

"The rubber industry, during the last and recent years, has been very competitive—in fact, one of the most competitive of all industries. This has been good because it has provided us with a terrific and daily challenge to improve our products, our manufacturing



Seen at the panel discussion on "Legislative Impact on Business" are (left to right): Representative William H. Ayres; RMA president Ross R. Ormsby; RMA vice-president W. J. Sears, and Stephen F. Dunn, vice-president of NAM.

processes, and our merchandising and selling techniques. We have all risen to this challenge, and that is why our industry has reached the heights it has attained today.

"I say to you, however, very frankly that I firmly believe that the selling competition we have seen in the last 20 years will be of the amateur variety compared with the hard hitting selling and merchandising competition that we will see in this new decade."

Among reasons for this, Mr. Hathaway cited imports increasing in volume and competitive impact, the effects of research and development technology in sharpening competition as between both rubber and an ever-widening range of plastics products, and the evolution of the American customer as a more selective and more sophisticated buyer.

To meet this challenge thus presented, he said, "it is now more important than ever for selling, advertising, merchandising and marketing—the whole broad area sometimes grouped under the heading of distribution—to get more attention than it has ever had before. I am not saying that selling has been easy in the last few years, but I am sure you will agree that not as much progress has been made in putting a fine point on selling and the other aspects of distribution as has been made in the engineering of equipment, design of the product, and research and development along technical lines.

"Distribution has not been as effective as production, and my point is that now a greater effort has got to be made to bring the effectiveness of the American distributive process in this industry, as in other industries, nearer to the levels already achieved in the product development and production portion of the American industrial picture."

Mr. Hathaway pointed out that profits in the rubber industry "have never been easy," and said, "there will be no easy profits even if the 'Selling 60's' become the 'Successful 60's.' There will be no place for slipshod marketing work and there will be a very great need for plans, men and devices which will result in the generating of real sales power at reasonable and practical selling costs. In other words, 1960 and the years after will be times in which not only will there be a need for effective marketing work —which is, of course, what I have been talking about — but also for *efficient* marketing work. We want to be successful in selling but we don't want to have it cost too much. We are not in business merely to sell—we are in business to make money."

In conclusion, Mr. Hathaway offered these predictions as regards the tire and non-tire products of the industry: "I think that in the tire business new types of tires will be developed and successfully sold and that new and improved rubbers will be used in these tires and in other rubber products.

"More and more rubber roads, rubber rail crossings, rubber sidewalks and conveyors of people as well as goods, more applications for rubber in clothing and in building and in transportation machines of all kinds including those that move by new principles and that have new sources of power are on the horizon for these coming years. And rubber will also find a wide variety of new applications in many industries not at all related to those which I have just mentioned.

"It will be a good decade and if we who are in the selling end of the rubber industry do our part, it will be a great decade. The year 1960 will be the best year the rubber industry has ever had and in many of the individual areas within the rubber field the same thing will be true.

"In conclusion, I say this to you—the 'Selling 60's' are holding out to us the possibility of great sales and great profits. I am convinced that the rubber industry will rise to its opportunity and that when this decade comes to an end we will look back upon this as the greatest selling decade of all time."

During the panel discussion on "Legislative Impact on Business," Congressman Ayres and Mr. Dunn discussed the recently passed labor bill and the effect it is likely to have upon business activities in the future. Mr. Ayres noted the effect which individual letters have upon legislators.

Discusses Southeast Asia

In his luncheon address, General Romulo stated that when we speak of Southeast Asia we must not overlook the one central fact in Asian life which is nationalism. He pointed out that this concerns the American people in a vital way. The uncommitted nations in Asia have a total population of more than 500 million people. These are neutral people, siding neither with the United States nor with Soviet Russia.

"But to the United States," General Romulo declared, "it really means a minus, because these newly emerging nations in Asia, who are basically following the pattern of the representative form of government, should normally be counted on your side. But since they refuse to cast their lot with you in your struggle against Communism they are therefore a minus, and what

George R. Vila

Earl B. Hathaway

a formidable minus it is—more than 500 million Asians not *with* you, added to the 600 million Chinese *against* you, and you have a total of more than one billion Asians that must be deducted from the forces of democracy against Communism.

"What is the driving force behind Asian nationalism? It is essentially a fight for equality, insistence on recognition of their rights as human beings, assurance that they are not and will not be discriminated against. Economic aid is important and so is technical assistance and both are appreciated when given to any recipient country in Asia. But at this juncture of our national history, equality is paramount to us, and it is this point that I wish to emphasize to the American people. To the pragmatic Western mind it is difficult to understand the Asian emphasis on equality over economics. The Asian is used to poverty and hunger; more important to him after centuries of indignities and humiliation is respect for the dignity of his human soul.

"And that is why, addressing American businessmen on the subject of Southeast Asia, I wish to draw your attention to what in our section of the globe is your Achilles' heel and which is being daily misrepresented, magnified and distorted by Communist propaganda. Human relations are of greater significance to us than anything else. If it is true that the democratic way of life is the spiritual way, then it is essential, if it is to win adherents in Asia, for it to be projected as one that places the highest value on the human individual, that it acknowledges that we are all created in the image of our Lord, and thus created, we are equals no matter what the color of our skin or the name of the church where we worship. The test of American spirituality in Southeast Asia, therefore, lies in how America practices that one line in your Declaration of Independence: *All men are created equal,*" General Romulo concluded.

Wiegand Named to Receive 1960 Goodyear Medal

► W. B. Wiegand, retired vice-president of the Columbian Carbon Co., New York, N. Y., has been named to receive the 1960 Charles Goodyear Medal in recognition of his important contributions in the field of carbon black. A citation announcing this fact states that Dr. Wiegand showed the relationship which exists between the surface of a filler and its reinforcing effect. He developed the theory that the reinforcing effect is attributable to the surface forces between the filler and the rubber. Dr. Wiegand has also made contributions to mixing methods; heat treatment of black; electron microscopic pictures of carbon black particles, the development of furnace blacks, etc.

The recipient of the Colwyn Medal for 1956, Mr. Wiegand worked with carbon black for more than 30 years. His developments were in the areas of pigment reinforcement of rubber; dustless carbon black; modification of surface characteristics of carbon black particles; pH properties of colloidal carbons; electron microscope studies of carbons and their relations to rubber reinforcement; the chain structure of carbon particles and its control; development of furnace process for producing carbon black and the improvement of the product, and the Joule effect and Carnot's cycle connected with rubber as demonstrated in the rubber pendulum and the rubber motor.

Mr. Wiegand, who was born in Conestogo, Ontario, Canada, received his B. A. and M. A. degrees at the University of Toronto. He became technical superintendent at the Dominion Rubber Co. in 1914 and later joined the Ames Holden McGready Rubber Co. as general manager. In 1923, he was named managing director of the Ames Holden Tire Co., remaining in that position until 1925, when he joined Binney & Smith as director of research. Mr. Wiegand was appointed director of research for the Columbian Carbon Co. in 1936 and in 1948, he was also named a vice-president. He has written 62 technical papers, 37 of which were pertinent to this citation. Mr. Wiegand is a Fellow of the Institute of the Rubber Industry, the American Institute of Chemists and the Chemical Institute of Canada. He was chairman of the Division of Rubber Chemistry of the American Chemical Society in 1923.

New Goodrich Tire Compound

► B. F. Goodrich Co., Akron, Ohio, has introduced a new compound for passenger tire treads that is said to give a softer, quieter ride than present tires. According to E. F. Tomlinson, president of B. F. Goodrich Tire Co., a division, the new tires engulf small objects on the road and absorb road vibration to give a better ride. The compound is also said to eliminate squeals caused by turns or sudden stops, without sacrificing any other important tire qualities. A Goodrich spokesman said the new compound is being used on all tires used as original equipment on new cars and on the comparable grade sold as replacement tires. Price of these remains the same, the company said.

Goodyear to Promote Foam Cushion

► Goodyear Tire & Rubber Co., Akron, Ohio, plans to launch a major sales campaign in the foam cushioning field during 1960. The company will increase distributor and field service organizations and has formulated a five-point program for its foam products. Goodyear will market new and improved foam rubber based 100 per cent on its new synthetic rubber latex, Pliolite 5352; establish a new warehouse program for distributors to insure a more efficient and economic flow of goods to customers; open a field operating point at Hickory, N.C., and establish a new sales territory in the Southwest, with headquarters in Houston, Texas; increase advertising and sales promotion of foam products at all customer levels; and promote for selected applications its own polyurethane product, Pliofoam.

Air Separation Unit Planned

► Air Reduction Sales Co., New York, N. Y., has announced plans for the construction of a new air separation plant to supply oxygen by pipeline to the Tennessee Coal and Iron Division of the United States Steel Corp., Fairfield, Ala. In addition, another plant for the production of gases of the atmosphere is being erected at the same location to serve customers in the Southeast. The plants, which will have a production capacity of 145 tons daily of high purity industrial gases, will be installed and operated by Air Reduction. Tennessee Coal and Iron will use the oxygen in metallurgical applications in the manufacture of steel as well as for general steel mill purposes. Ground will be broken immediately and it is anticipated that equipment and facilities will be installed and in operation within 18 months.

Retires from DuPont

► Carl A. Bartle, a sales executive for E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and a widely known figure in the rubber industry, has retired from the company after a career of almost 37 years. Mr. Bartle, a native of Philadelphia, Penna., received a B.S. degree in electrochemical engineering from Pennsylvania State College in 1916 and afterwards, joined the Aluminum Co. of America as a research engineer at its Niagara Falls, N. Y., plant.

In 1918, Mr. Bartle became associated with DuPont as a chemist and later that year, he was named production supervisor at the company's Repauno plant at Gibbstown, N. J. The following year, he joined National Aniline and Chemical Corp. at Marcus Hook, Penna., as chemical supervisor of production, returning to DuPont in 1923, when he was assigned to sales in the New York office of what was then the Dyestuffs Department.

Mr. Bartle was transferred to the Chicago district sales office in 1925 and in 1929, he was appointed assistant sales manager for rubber chemicals at Wilmington, Del. He was named sales manager of the Rubber Chemicals Division, now the Elastomer Chemicals Department, in 1932 and sales director in 1943. Mr. Bartle continued to head up the sales of rubber chemicals until a year ago, when he was named a special assistant pending his retirement. A past chairman of the New York Rubber Group, he is also a member of the Buffalo, Boston, Chicago and Philadelphia Rubber Groups and the Rubber Division of A.C.S.

Goodrich Power Grip Tire

► A low-priced farm tractor tire, named the Power Grip, has been announced by the B. F. Goodrich Tire Co., a division of the B. F. Goodrich Co., Akron, Ohio. Patterned after the Silvertown Power Grip original equipment tire, the new tire is said to offer many of the same features at a 20 per cent lower price. An improved cleat design and an increase in the number of cleats give the tire improved traction and wear characteristics, the company states. It is available in sizes 8.3-24 through 16.9-34.

Putnam Named Manager

► U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corp., New York, N. Y., has appointed John A. Putnam as manager of its Atlanta office. Mr. Putnam has been a sales representative operating out of the U. S. I. New Orleans Sales Division since 1952 and has been located in Atlanta for the past two years. He received his college training at the University of Michigan and served with the U. S. Army from 1945 through 1947.

Morrison M. Bump

Named Executive Vice-President

► Morrison M. Bump has been elected executive vice-president of the United Carbon Co., Inc., and he will also continue to serve as director of marketing for the parent firm, United Carbon Co. In addition to corporate marketing responsibilities, Mr. Bump will direct all marketing activities including domestic and international sales, technical service, distribution, and marketing public relations and advertising for the subsidiary organization. He will be located at the company's new marketing headquarters at 410 Park Avenue, New York, N. Y. Before joining United Carbon, Mr. Bump was president of the Union Paste Co.

Named Senior Research Scientist

► Edward M. Bevilacqua has been promoted to senior research scientist at the Research Center in Wayne, N. J., of the U. S. Rubber Co. Dr. Bevilacqua is a member of the staff of the Synthetic Rubber Research Department, now studying problems related to deterioration of rubber during use. He received a B. S. degree in chemistry at Rensselaer Polytechnic Institute in 1941 and a Ph. D. degree at the University of Wisconsin in 1944. He joined the rubber company that same year and has done research on natural rubber and latex, heat resistant polymers and graft polymers as well as rubber deterioration. A series of his articles on the effects of heat and oxygen on rubber has been published in technical journals.

Firestone Opens Exhibit

► Firestone Tire & Rubber Co., Akron, Ohio, inaugurated on September 30, 1959, a special corporate exhibit at the Exhibit Hall of the New York Stock Exchange, New York, N. Y. At the same time, the company issued a publication entitled "Highlights of the Years" which outlines Firestone's history from 1900 to the present.

Anchor Expands Facilities

► Research and Development Laboratories of Anchor Industries, Cleveland, Ohio, center of quality control and product improvement for Doan Motor Mounts and companion products, have been expanded to five times their former size. According to the company, $100,000 was spent in the research and development expansion. Five full-time chemists and laboratory technicians staff the chemical and rubber laboratories with Doan engineers and outside specialists providing regular consulting service.

In addition to personnel and space expansions, several new installations including testing and research equipment, have been purchased or built by Doan engineers for thorough quality control of the motor mounts, floor mats and other Armor-Flex rubber automotive accessories and replacement items produced for Doan. Materials and finished mounts are put through severe inspections including pull tests to determine adhesion between steel and rubber; checks on resistance to oil, heat, compression and tearing; to basic qualities as live and soft rubbers, needed to absorb motor vibrations many thousands of times.

Advastab T-360 Stabilizer

► A stabilizer with heat stability said to be at least twice that of any other product on the market, which offers rigid vinyls heat distortion temperatures 8 to 12° higher, has been introduced by Advance Solvents and Chemical, New Brunswick, N. J. Advastab T-360, an organo-tin in crystalline form, gives unexcelled heat and light stability in one package and enables the processor to do things with vinyl heretofore impossible due to inadequate heat and light stability, according to the company. With the new Advance stabilizer, the finished product is said to be stabilizer odor-free; retain original resin heat distortion; and have uncompromised formulation for optical clarity, proper lubrication control, atmospheric staining control, and plate-out processing.

Stauffer Plans New Facility

► Plans to construct a new carbon bisulfide plant at Delaware City, Del., have been announced by the Stauffer Chemical Co., New York, N. Y. The new plant will be located on property purchased from Tidewater Oil Co. Construction is expected to begin shortly with completion scheduled for November, 1960. The plant will use methane from Eastern Shore Natural Gas Co. and sulfur from Tidewater. Designed and engineered by Stauffer's Engineering Department, the new petrochemical unit will use processes currently employed at Stauffer's bisulfide plant at LeMoyne, Ala.

Sun Files Payment Plan After Court Upholds Patents

► Sun Rubber Co., Akron, Ohio, filed an amended petition in federal court November 10 to pay unsecured creditors, two weeks after the Circuit Court of Appeals in Cincinnati upheld the firm's five-year long patent suit. Under the plan, creditors who are due amounts up to $100 would be paid in cash, while 10 per cent or $100—whichever is the greater—would be provided for claims in excess of $100. The petition also asks payment in full on all claims on or before July 10, 1960.

The stage for eventual resumption of production by the company, which went into bankruptcy 18 months ago, was set by the decision affirming the validity of two key Sun Rubber patents on a rotational casting process for polyvinyl resin, and holding that one of them had been infringed by both Akron Presform Mold Co., Cuyahoga Falls, and National Latex Products Co., Ashland, Ohio. Retail value of articles made with this process is estimated to exceed $150 million annually and is expected to more than double in the next five years. The company hailed the decision as providing the means for resumption of manufacturing in the near future and, in preparation, signed a new contract with Local 58 of the United Rubber Workers.

Harold F. White, referee in bankruptcy at Akron, set the hearing on Sun's payment petition for 1:30 p.m., December 4. He had granted postponement pending the outcome of the patent infringement suits after creditors rejected the company's original plan for payment of unsecured claims within five years. Counsel for Akron Presform and National Latex are expected to join in a request for a rehearing of the patent case by the Circuit Court because of its 2-1 split in the decision.

AviSun Names Sales Agent

► AviSun Corp., Philadelphia, Penna., which recently began commercial production of polypropylene polymer at Port Reading, N. J., has announced the appointment of A. Schulman, Inc., Akron, Ohio, as its sales agent in the plastics injection molding and extrusion industries. Schulman will provide nation-wide sales coverage for AviSun polypropylene. The product will be warehouse stocked at various key points around the country, ready for quick delivery to customers by Schulman. Technical service will be supplied by plastics technologists from AviSun. The company will sell through Schulman to the plastics molding industry and will also market polymer directly to producers of monofilament, coated papers, films, etc. AviSun will shortly offer polypropylene film on a commercial basis and early in 1960 expects to have polypropylene fiber available commercially.

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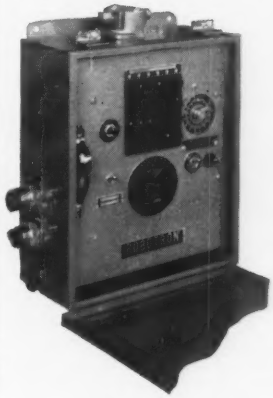

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Harry G. Bimmerman

Assigned to New Post

► Harry G. Bimmerman has been named to the newly created post of manager of personnel planning for the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and will also take on the added duties of manager of rubber chemicals. The appointment of Mr. Bimmerman, formerly director of the Elastomers Laboratory at Chestnut Run, was one of a series of personnel moves in the Sales Division. Dr. Arthur C. Stevenson, assistant director of the Elastomers Laboratory, has been appointed to succeed Mr. Bimmerman as director and Malcolm A. Smook, a laboratory division head, has been named to succeed Dr. Stevenson as assistant director in charge of development. John S. Rugg, also a division head, has been named assistant director with responsibility for customer service, while Dr. Chester C. McCabe and Dr. C. Minor Barringer have been appointed division heads. Responsibility for the sale of Viton synthetic rubber has been assigned to William H. Ayscue, who became sales manager for Viton and Hylene organic isocyanates.

Installs New Equipment

► Polymer Dispersions, Inc., Fairport Harbor, Ohio, has installed production facilities to produce polymer color concentrates and dispersions. The sales will be handled by Harwick Standard Chemical Co. under the Harwick Stan-Tone registered trade name. Banbury and other necessary equipment is available to produce, pelletize and package polyethylene color concentrates and cutbacks, under the Stan-Tone PE designation, as well as other dispersions to customer needs in the blow molding, filament, film, pipe and wire and cable industries. Harwick Standard will continue customer service and color matching work at its Akron Color Laboratory. Research and development on polymer concentrates will be handled at the Polymer Dispersions laboratory facilities.

Hancock Added to Hall of Fame

► Thomas Hancock, English manufacturer and inventor (1786-1865) was added to the University of Akron's International Rubber Science Hall of Fame at the annual Hall of Fame Banquet on November 20. He is the sixth person to achieve this distinction. Mr. Hancock's citation read, "A manufacturer and inventor, who, because of the important part he played in the establishment of rubber manufacturing has justly been called the 'Father of the Rubber Industry;' who in the earliest days of the industry contributed machines and techniques required for the successful fabrication of rubber goods, and who, thanks to his enterprise, energy and ingenuity, greatly extended the range and variety of manufactured articles."

Mr. Hancock's basic contributions included the designing, construction and operation of a machine for masticating rubber and so massing and plasticating it (1820); means for converting masticated rubber, under pressure, in molds, into blocks and for cutting from sheets and blocks (1820); and a spreading machine for the application of rubber solution to fabrics (1827). Others in the Hall of Fame are: Charles Goodyear (American, 1800-1860), C. Greville Williams (English, 1829-1910), Carl O. Weber (German, 1860-1905), Henri Bouasse (French, 1866-1953), and Evan I. Ostromislensky (Russian, 1880-1939).

Acquires Houston Rubber

► Wyatt's Plastics, Inc., Houston, Texas, has acquired the Houston Rubber Co. and has announced that the firm now offers a major custom molding facility to Southwest industry. Through the combination of facilities, Wyatt's is now capable of molding all thermosetting plastic materials, and a complete line of elastomers including buna N, neoprene, natural rubber, styrene rubber, silicone, Viton and Hypalon. A fully staffed and equipped Rubber Chemistry Department is being added for the rubber operation in order to continue Wyatt's plastics activity in product research, development and quality control.

Wyatt's is now installing a 200 ton molding press to handle large one piece moldings. This new press, combined with existing 1000 ton and 600 ton presses, offers a facility with some of the largest molding equipment in the South. The Houston Rubber Division will continue the sale and distribution of standard sizes and manufacture of non-standard sizes of oil tool and industrial grade O-rings. A complete rubber engineering O-ring service is planned. Personnel of the Houston Rubber Co. will remain with the Houston Rubber Division. Ira Frazier will continue as plant manager and A. T. Schwarzback, Jr., will move into Wyatt's technical sales staff.

William R. Peterson

Named Polymer Research Supervisor

► Dr. William R. Peterson, formerly a senior research chemist in the Basic Polymers Research Laboratory of the Continental Can Co., has been appointed supervisor of polymer research for the United Carbon Co. To be located at the Baytown, Texas, laboratory of United Rubber and Chemicals Co., a subsidiary of United Carbon, Dr. Peterson will direct exploration on current styrene-butadiene polymers for the rubber tire and mechnical goods industries and will investigate other application and polymer areas. Before his assignment at Continental, he spent five years as a research chemist for DuPont. He is a native of Waukesha, Wisc., and received his doctorate from the University of Illinois. Dr. Peterson is a member of the American Chemical Society and the Toastmasters.

Goodrich Chemical Textile Show

► B. F. Goodrich Chemical Co., Cleveland, Ohio, a division of B. F. Goodrich Co., Akron, Ohio, held a textile show on October 19 to 23 at the Sheraton-Atlantic Hotel in New York City. Displayed and demonstrated at the show were products and processes involved in furnishing the textile finishing and converting trades with a broad range of chemicals for use in upgrading fabrics and improving textile manufacturing processes. The show was a result of a cross-linking of chemical product lines into a marketing and development unit designed to increase its share of the $400 million textile chemicals market.

The exhibit, designed to inform fabric converters and finishers of the possibility of chemical treatment, featured such basic raw materials as vinyl, acrylic, nitrile and vinyl latices, and Carbopol. Displayed and demonstrated were products and processes for improving such physical properties of fabrics as wear-resistance, color fastness, hand and drape, stretch control, shrinkage control, ravel resistance, and textile printing and coating.

Detroit Group Features Talks On Plastic Truck Cabs

► The Detroit Rubber and Plastics Group held a dinner and meeting on October 2, at the Hotel Leland in Detroit, Mich. Plastic truck cabs were discussed at the pre-dinner technical session by Bert C. Harris (White Motor Co.) and J. R. Hammond (Molded Fiber Glass Body Co.). The after-dinner speaker was David J. Jay (Ford Motor Co.) who discussed Ford's Levacar project.

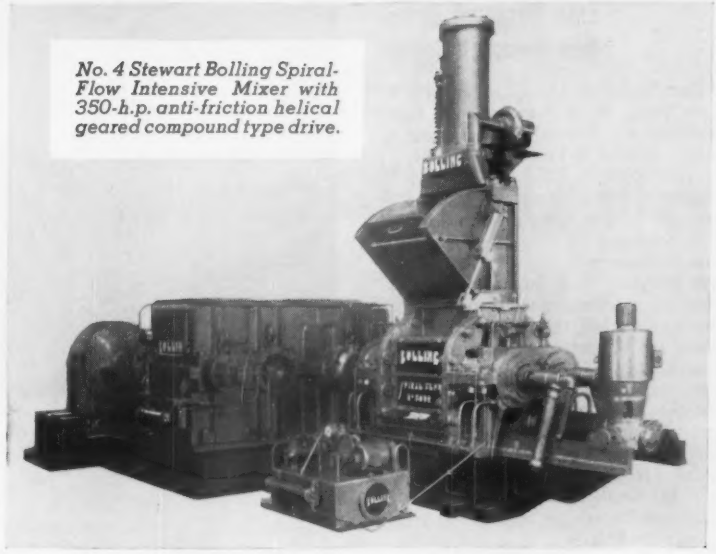
"Truck Cabs of Fiber Glass" was the title of the talk presented by Mr. Harris. He described the advantages of plastic truck cabs to truckers, and pointed out that one of the chief advantages is a substantial reduction in weight. In addition, he stated that the reinforced plastic parts are also completely impervious to rust and corrosion. Mr. Harris also stressed that the high impact strength and elasticity of a fiber glass reinforced plastic part reduces damage due to minor collisions.

Mr. Hammond spoke on "The Production and Use of Molded Fiber Glass and Truck Cabs." He described in some detail the manufacturing methods employed in producing and assembling the cab for White Motor Co. He pointed out that each of the 36 parts employed in the cab is molded in matched metal dies in a hydraulic press. Mr. Hammond explained that the matched metal die method of producing fiber glass reinforced plastic parts was chosen for several reasons: to obtain the highest and most consistent physical properties; to maintain the closest control over material thickness; to obtain a smooth surface on both sides of the part; to obtain the highest possible production rates; and to obtain the lowest cost.

In his after-dinner presentation, Mr. Jay treated the Detroit group to an inside look at Ford's Levacar project, the name given to the company's wheelless vehicle development. Mr. Jay showed a new color motion picture demonstrating the principles involved in the "air pad" method of transportation. Also included in the film were action pictures of the Levascooter and the first one-passenger Levacar to be produced by Ford. According to Mr. Jay, the practicability of the system has been sufficiently well-proved so that Ford is planning to build a four-passenger vehicle for further study.

Appointed Research Supervisor

► Marshall E. Doyle has been appointed a research supervisor at the Emeryville (Calif.) Research Center of the Shell Development Co., where he will head a group in Shell's Thermoplastics Department. Mr. Doyle joined Shell in 1947 as a junior laboratory assistant. Subsequent promotions brought him to the position of junior chemist in 1955 and to chemist two years later. He joined the Thermoplastics Department when it was organized earlier this year.



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Esso Research Opens New Research Center

► Esso Research and Engineering Co., New York, N. Y., opened and dedicated its new research and engineering center, located in Florham Park, N. J., on November 5. Governor Robert B. Meyner of New Jersey and top executives from the company, the parent firm, Standard Oil Co. of New Jersey, and affiliates took part in the dedication program. According to Eger V. Murphree, president of Esso Research and Engineering, the new facilities represent the biggest expansion in the 40-year history of the oil research firm. The center includes three structures housing some 800 engineers, scientists and aids. Initially it will be devoted to engineering and oil processing research, stated Mr. Murphree. The center will be the fountainhead of engineering skills and knowledge required by Jersey Standard affiliates around the world.

One of the interesting features of the new research center is the Process Research Building with its 11,000 square foot bay area that is almost four stories high. In this area, new processes and improved versions of old processes will be scaled up into pilot plant units. Mr. Murphree reported that these pilot units are, in essence, small prototypes of large refinery units of the future.

Includes Digital Computer

Another feature of the center is an IBM 704 digital computer which has a new magnetic-core memory with a capacity to store 32,000 words. This big computer can total all the numbers from 1 to 8,000 in a fifth of a second. In one day it can do computations that would take 35 skilled mathematicians their entire lives to work out, Mr. Murphree explained. He pointed out that the computing center aids scientists and engineers in two ways: it enables them to operate in mathematical realms that were previously out of the question; and it gives them more time for creative work by doing time-consuming calculations for them.

The center also has a large Electronic Associates analog computer. This equipment includes five graph plotters for recording outputs, plus a special oscilloscope display for plotting up to eight output curves simultaneously.

Featured speakers at the dedication ceremony were Marion W. Boyer, a director of the Standard Oil Co. of New Jersey, Honorable Robert B. Meyner, governor of the State of New Jersey, and Dr. George B. Kistiakowsky, special assistant to the president of the United States on science and technology. The dedication plaque was unveiled by Honorable Joseph H. Crane, Jr., mayor of Florham Park, N. J.

Eger V. Murphee (right), president of Esso Research and Engineering Co., discusses the advantages of the facilities housed in the firm's new scientific center at Florham Park, N. J. with RUBBER AGE staff editor B. M. Berns.

In his talk on "The Promise of Florham Park," Mr. Boyer stated that every dollar spent to develop new products and improve technology, earns approximately five dollars in return. He explained that at the outset close to one hundred process research people will be engaged in exploring ways of making products more efficiently by devising simpler, cheaper processing techniques. According to Mr. Boyer, the most accurate view of the new center is that it is the birthplace of Jersey Standard refineries around the world.

Governor Meyner pointed out, during his remarks, that what the new center demonstrates primarily is the essential partnership of science and industry in advancing human welfare. He pointed out that this partnership has created social problems which are as yet little understood, but the benefits of science to society have far outweighed the disadvantages.

The final speaker at the dedication program, Dr. Kistiakowsky, remarked that in the last 25 years petroleum has taken on new significance as a source of synthetic organic chemicals. He pointed out that important industries have grown up around the production of detergents, synthetic rubber, synthetic fibers and plastics, and out of these flows an unending stream of products of bewildering variety. He stated that it is typical of the forward looking spirit of American enterprise that the Esso Research and Engineering Company should crown its already excellent facilities with this splendid new research center.

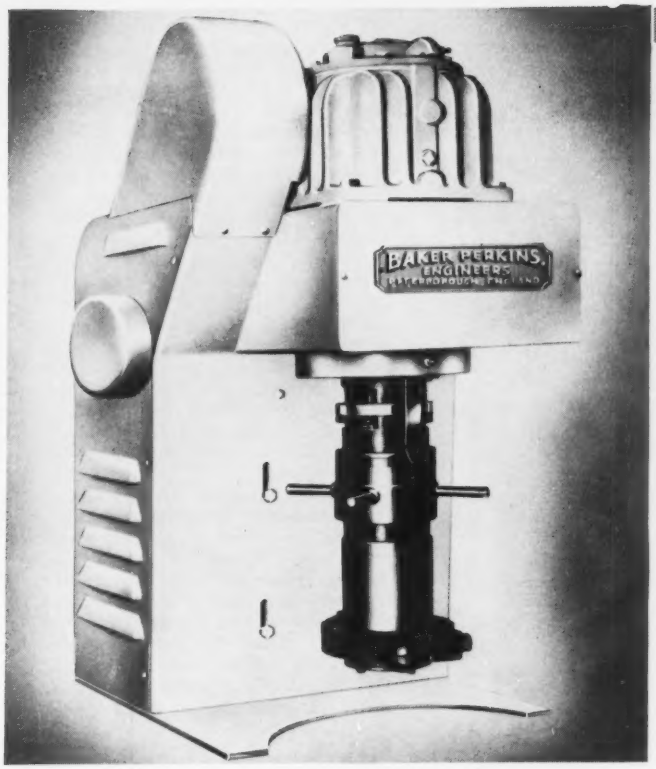
Pennsalt Pennox Series

► Pennsalt Chemicals Corp., Philadelphia, Penna., has developed the Pennox antioxidants, to meet a variety of rubber applications. The new products are said to protect light and dark stocks, raw hevea and styrene polymers, their vulcanizates, and latex products from the deteriorating effects of oxidizers, heat and light. All four of the Pennox antioxidants are free flowing, syrupy liquids which can be compounded with dry rubber on a mill or a mixer. They have no noticeable adverse effects on the processing characteristics of rubber compounds during mixing or curing, Pennsalt states.

Pennox A is said to be an excellent general purpose alkylated amine antioxidant which effectively resists age in both dry rubber and latex products. Its slight discoloring may limit its use in light colored stocks. Pennox B is a nonstaining, nondiscoloring antioxidant for hevea and styrene rubber vulcanizates and raw styrene polymer. Pennox C provides good protection to hevea and styrene vulcanizates and is especially recommended for latex compounds because it shows exceptional resistance to discoloration on exposure to sunlight, according to Pennsalt. Pennox D will provide good nonstaining and nondiscoloring antioxidant activity in dry hevea and styrene vulcanizates and latex films. It may also be used in latex foam goods although it is not as effective in this application as either Pennox A or Pennox C, Pennsalt states.

Installs Steam Generator

► General Tire & Rubber Co., Akron, Ohio, plans to install additional steam generating facilities at its main plant including a gas-fired generator which will boost the steam output by 25 per cent. Additional steam is needed for the heating of buildings and the processing of materials, General Tire states. A two story building wing to house the new boiler and auxiliary equipment will be added. The company expects the gas fired unit to cut down fumes, dirt and smoke.



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O'Neil Marks 50th Year in Rubber Industry

► William O'Neil, president of the General Tire & Rubber Co., Akron, Ohio, recently celebrated his 50th anniversary in the rubber industry. In a special issue of the *Akron Beacon Journal*, which appeared on October 28, Akron businessmen and industrialists throughout the country paid tribute to Mr. O'Neil and the dynamic role he has played in the rubber industry.

A native of Akron, Mr. O'Neil attended Holy Cross College and for a time worked on the side as a cost accountant at his father's textile mill. After graduation in 1907, he returned to Akron and worked in the Merchandising Department of the family store. A short time later, he left the family store and, under doctor's orders, headed West. With his father's assistance, Mr. O'Neil and Win Fouse, who had been an auditor at the Firestone Tire and Rubber Co., established a Firestone distributorship in Kansas City. Later, they added a manufacturing sideline, primarily for the production of tire repair materials.

By 1915, the O'Neil-Fouse combination was a concern earning half-million dollars gross a year. The partners then sold the tire business in Kansas City to Firestone and returned to Akron. There, with other investors, they established the General Tire & Rubber Co. Michael O'Neil, Mr. O'Neil's brother, was the first president of the organization and Mr. O'Neil was executive vice-president. The firm was staffed with J. Jahant as head of the Production Department; Robert Iredell as chief engineer; and Harold B. Pushee as head of the Chemistry Department.

Production was started in the Spring of 1916 and during the first year, the repair materials business was retained. Later, Mr. O'Neil established a distributor organization which would make it possible for the dealer to prosper as the factory prospered. He also planned an advertising program, naming his brother, Thomas O'Neil, factory manager. Many dealers were attracted through the first full page advertisement which appeared in the *Saturday Evening Post*.

Since then General Tire has expanded, ranking as a major rubber firm and controlling many and varied operations. These include subsidiaries Aerojet-General and RKO General, which are said to be leaders in the fields of missiles and entertainment. The firm is also majority stockholder in the A. M. Byers Co., Pittsburgh, Penna.

Dorr Consultants Formed

► A new firm of consulting engineers, Dorr Consultants, has been formed to provide engineering, financial and management services to the chemical process, textile and metallurgical industries. Its headquarters will be at 99 Park Ave., New York, N. Y. The five founding partners are: John Van Nostrand Dorr, inventor of metallurgical and sewage treatment equipment; Arthur K. Doolittle, a specialist in solvent-resin technology, protective coatings and adhesives; Donald F. Othmer, head of the Chemical Engineering Department at Polytechnic Institute of Brooklyn; W. George Parks, Chemistry Department head at the University of Rhode Island; and William E. Rudolph, who is widely experienced in mining, metallurgy and water supply systems.

Goodyear Boosts Vinyl Floors

► Goodyear Tire & Rubber Co., Akron, Ohio, has announced that it will shift production of all types of flooring, counter toppings and wall coverings exclusively to vinyl materials on December 31. After that date the company will discontinue all its rubber flooring lines and all research and development, production, sales promotion and advertising will concentrate on vinyl flooring materials.

This major move is based on the fast growth shown by vinyl wall and floor covering products as revealed by sales figures. According to Goodyear's Flooring Sales Department, a 29 per cent increase marked sales of vinyl flooring during the first nine months of 1959 over the same period of 1958, which had been a record year for the firm.

NCRG Hears Alstadt On Rubber-to-Metal Bonding

► The Northern California Rubber Group held a technical meeting on November 5 at the Elks Club in Berkeley, Calif., with 70 members in attendance. The featured speaker was Donald M. Alstadt (Hughson Chemical Co.) who discussed "Theoretical and Practical Aspects of Rubber-Metal Bonding." Mr. Alstadt stated that the major factors influencing the adhesive bonding of an unvulcanized elastomer to metal may be divided into three groups: (1) factors involving the character of the elastomer to be bonded; (2) factors involving the adhesive polymer nature; and (3) factors involving the structure of the metal.

He pointed out that for adhesion at polymer-polymer interfaces, conditions favoring the formation of primary valence bonds, inter-facial wetting, and inter-facial diffusion must be promoted. Chemical and physical characteristics, he added, of both the adhesive and elastomer systems must be controlled to produce such effects. He explained that the atomic structure of the base metal, the character of surface films and metallurgical state of the metal substrate all affect the adhesive-metal interface union.

Mr. Alstadt also remarked that miscellaneous rheological electrochemical and mechanical factors also affect the strength and environmental resistance of the adhesive bond. He stressed that certain fundamental principles underlying the operation of any adhesive system are also valid for the adhesion of rubber to metal.

Nelson Opens Arizona Office

► Nelson Employment Service opened a new branch office at Phoenix, Ariz., on the 10th anniversary of the founding of the concern in Akron, Ohio, by Harold Nelson. There are branch offices in Cleveland and Canton, and the firm is in a network that gives it nationwide coverage of the employment field. Mr. Nelson, who founded the firm in 1949, specializes in placing men and women for the rubber industry. Placements have extended to such far away points as Egypt and Dutch East Guinea.

Smith Chemical Named Agent

► Smith Chemical & Color Co., Inc., Brooklyn, N. Y., has been appointed by the Organic Chemicals Division of Olin Mathieson Chemical Corp. as a warehousing distributor for its line of glycols, polyglycols, glycol ethers, ethanolamines and surfactants. Tank-car, carload and truckload shipments of these organic chemicals direct from the Doe Run, Ky., plant as well as less than truckload drum deliveries from Brooklyn warehouse stocks are promptly available, according to Smith Chemical.

The severe, ill-fitting "envelope" bathing cap of former days is outmoded. Imaginative styling has taken over, to create a crown of beauty out of new polymers.

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Names in the News

Dr. Charles F. Jelinek, formerly manager of Process Research and Development Department at the Rensselaer, N. Y., plant of the Dyestuff & Chemical Division of General Aniline & Film Corp., has been appointed manager of new fields research at the company's Central Research Laboratories in Easton, Penna. He succeeds **Dr. Joseph M. Wilkinson, Jr.,** who was recently named director of development of General Aniline's newly created corporate Development Department.

Gordon R. Lichtwardt, previously passenger tire sales manager for General Tire & Rubber Co.'s Charlotte, N. C., Division, has been appointed advertising manager for the company.

Eugene N. Beesley, president and member of the board of directors of Eli Lilly & Co., has been elected a member of the board of directors of U. S. Rubber Co.

Warren A. Brown, previously vice-president of Florence Pipe Foundry and Machine Co., has been named to succeed **E. Roy Russell,** who has retired as president of the Florence company and R. D. Wood Co.

Dr. Charles J. Chaban, director of research and development for the Landers Corp., has been elected vice-president for research.

Frederick Knight, previously with Darling & Co., has joined Borg-Warner Corp., as chemical buyer for its Marbon Chemical Division.

Thomas D. Lewis, Jr., previously sales representative, has been appointed assistant sales manager of the Tire Cord Industrial Products Division of Industrial Rayon Corp.

Joseph P. Palumbo, formerly product sales manager for organic peroxide catalysts and accelerators, has been named manager of the Plastics Industry Division of Nuodex Products Co., a division of Heyden Newport Chemical Corp.

Benjamin P. Cooper, formerly sales manager at the Firestone plant in Venezuela, has been named sales manager for the Firestone International Co. He succeeds **Frank B. Norton,** who recently was named manager of the United States Trading Co., in Monrovia, Liberia.

Jack A. Bush has been named manager of sales engineering for oil seals for Yale Rubber Manufacturing Co.

W. C. Franklin has been appointed manager of the newly organized Polychemicals Department of Texas Butadiene & Chemical Corp. **R. M. McFarland** has joined Texas Butadiene as manager of market development, and **J. C. French** has joined the company's Market Research Department.

J. E. Gallagher, formerly with Evanite Plastics Co., has joined Marbon Chemical Division of Borg-Warner Corp., as a sales service extrusion engineer.

G. J. Esselen, previously sales manager of the Activated Carbon Division of Pittsburgh Coke & Chemical Co., has been named sales manager of the firm's Industrial Chemicals Division.

Raymond H. Blanchard, president of B. F. Goodrich Footwear and Flooring Co., has been installed as the 24th president of the Associated Industries of Massachusetts.

W. K. Adkins, chief engineer for Firestone Tire & Rubber Co., has been named chairman of the Professional Engineers Conference Board for Industry, Inc.

V. L. Petersen, chief of chemical purchasing for Goodyear Tire & Rubber Co., has been named purchasing agent for the company, succeeding **Rollin D. Chittenden,** who has retired after 39 years with the company.

George E. Lorand, previously with H. K. Porter Co., has joined Bloomingdale Rubber Co.

William N. Maclay, previously with B. F. Goodrich Co., has joined Kopper Co., as manager of latices research.

Edward W. Upton, formerly executive vice-president of Refinery Engineering Co., has been elected chairman of the board of directors and chief executive officer of New York Rubber Corp.

Dr. R. L. Bateman, director of market development for Union Carbide Chemicals Co., has been named to head the 1959-1960 fund drive for the library of the New York Chemists' Club.

Dr. Taylor Evans has been named manager of market research for Naugatuck Chemicals at Elmira, Ontario, Canada.

Dr. Arthur B. Beindorff, previously group leader of Nylon Polymer Corp., has been appointed personnel representative for the research center of Chemstrand Corp.

Roy A. Parker has been named Kansas City Sales Division manager for U. S. Industrial Chemical Co., and **Joseph G. Longstretch** has been appointed manager of the firm's St. Louis, Mo., sales office.

John W. Martin has been named project manager of the Commercial Development Department of Pittsburgh Coke & Chemical Co.

Dr. Donald Rivin has joined the technical staff at the research laboratories of Godfrey L. Cabot, Inc.

Stephen E. Taub has been appointed acting chief of the Engineering Department of Foster D. Snell, Inc.

Harvey F. Haight, formerly with Columbia-Southern Chemical Corp., has joined the technical staff of Texas Instruments, Inc.

Paul K. Benjamin, Jr., has been named product manager for the Fibrous Products Division of Union Asbestos & Rubber Co.

John R. Fuller has joined Acme-Hamilton Manufacturing Corp. as branch manager of its Houston, Texas, office.

Malcolm J. Odell has been named product development manager of Crocker, Burbank Papers, Inc.

Howard R. Fisher, formerly with W. J. Voit Rubber Corp., has joined Parker Seal Co., as chief chemist.

Roland H. Gray, Jr., has joined Dewey & Almy Chemical Division, W. R. Grace & Co., as manager of process development in research.

R. H. Strong has been named market development manager for Naugatuck Chemicals at Elmira, Ontario, Canada.

William R. Whitaker, formerly eastern sales supervisor for Carlisle Chemical Works, Inc., has been appointed to the sales management team of Advance Solvents & Chemical, a division of Carlisle Chemical.

Dr. Arthur E. Brooks, assistant director of research and development at U. S. Rubber Co., has retired after 30 years of service with the company.

William Dalton, president of Tyrex, Inc., has been elected to the board of directors of the association.

Jules D. Kippman, general manager of the Textileather Division of the General Tire and Rubber Co., was recently appointed to a state advisory committee on industrial and economic development by the governor of Ohio, the Honorable Michael DiSalle.

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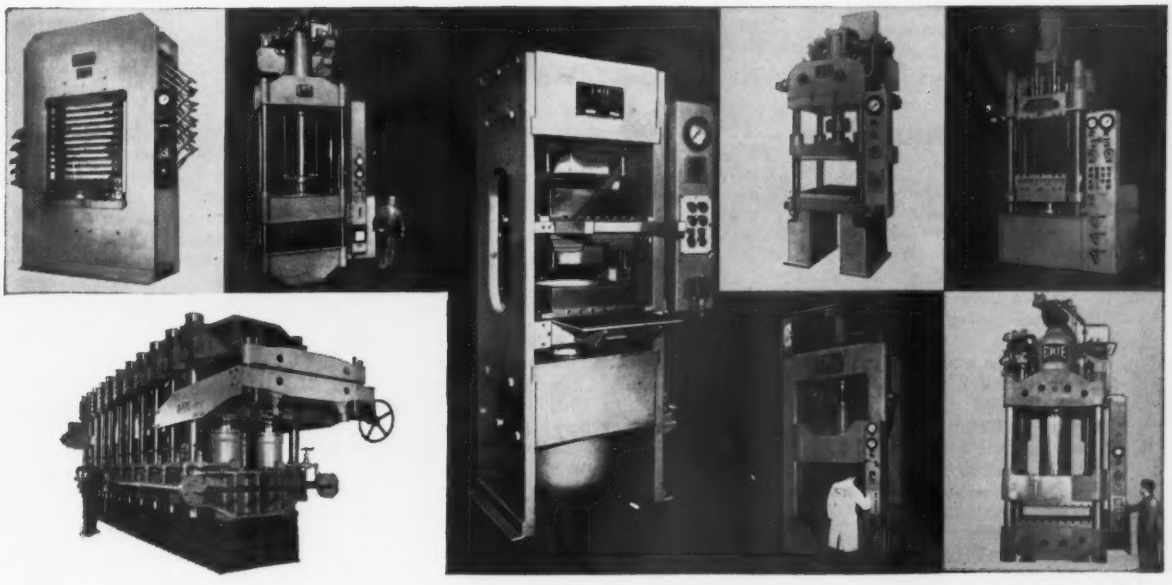

New Elastomers Discussed At Boston Group Meeting

► New elastomers was the subject of three talks presented at the Fall technical meeting of the Boston Rubber Group on October 16 at the Somerset Hotel in Boston, Mass. Two hundred and forty-five members and guests heard talks by Dr. Juan C. Montermoso (Quartermaster Research & Engineering Center, Natick, Mass.) on "Current Approaches to Elastomer Research;" Dr. D. A. Stivers (Minnesota Mining & Mfg.), on "Recent Developments in Fluorel Compounding;" and T. D. Eubank (DuPont) on "New Developments in Viton B."

Dr. Montermoso discussed the vital need for elastomers having a combination of properties such as chemical resistance, flexibility at extreme low temperatures, flame retardance and thermal stability at high temperatures. He pointed out that although there are existing elastomers that possess any one of these characteristics, a combination of two or more of these properties in one rubber is urgently needed. Dr. Montermoso outlined some of the more promising approaches in the inorganic and organometallic areas of investigation. He presented the status of the work on triazine derivatives; the sandwich type molecular structures of ferrocene titanocene and zircocene; and organo-metallics including those of tin, lead and germanium.

Dr. Stivers spoke on the development of fluoroelastomers which provide heat resistance, fluid resistance, compression set at high temperatures and low temperature flexibility. He compared currently available elastomers of this type, and discussed several Flourel compounds which were designed for specific properties and applications.

Left to right: Dr. D. A. Stivers (3M), Dr. Juan Montermoso (Quartermaster Research & Engr.) and T. D. Eubank (DuPont) discuss the elastomer program of the Boston Rubber Group's technical session held on October 16.

Mr. Eubank compared DuPont's new flouroelastomer, Viton B, with Viton A. He pointed out that vulcanizates and coatings based on Viton B remain usefully elastic for more than twice as long at any given temperature as those based on Viton A. In addition, he said, Viton B expands the already wide range of fluid service established for Viton A. Because of this, according to Mr. Eubank, Viton B should win even wider acceptance than Viton A in a number of difficult applications, particularly those requiring combined resistance to heat and fluids. Mr. Eubank presented test data showing Viton B with various curing agents in compounds to meet certain specifications.

A dinner was held after the technical session, and an after-dinner lecture on "Sea Sights and Sails Around the World" was given by Miss Priscilla Hiers.

Elastomer Group Hear Schmidt; Elects 1960 Officers

► The Elastomer and Plastics Group, Northeastern Section, A.C.A.S., held a technical meeting on November 17 at the Museum of Science in Boston, Mass. Over 60 members attended the meeting which featured a talk by J. E. Schmidt (Linde Co.) on "Molecular Sieves — Carriers for Active Chemical Compounds." Mr. Schmidt stated that molecular sieves are crystalline metal-silicates belonging to a class of minerals known as zeolites, and the structure of dehydrated zeolites offer a very high surface area for the adsorption of molecules. He pointed out that these molecules remain isolated from a reactive system until released from the molecular sieve. In this way, he continued, active curing aids can be utilized in rubber and plastic formulations in order to obtain rapid cure rates without sacrificing processing safety or pot life.

Mr. Schmidt explained that this principle can be applied to the curing of natural rubber, styrene-butadiene rubber, neoprene, epoxy resins, rigid vinyl plastisols, polyurethane foams and others. He presented data illustrating the latent curing aid principle and also covered the role of chemically loaded molecular sieves in epoxies and polyurethane foams.

During the Group's October 13 meeting, the following officers were unanimously elected to serve during 1960: *Chairman,* James H. Fitzgerald (Harwick Standard); *Chairman-Elect,* Henry A. Hill (National Polychemicals); *Secretary,* Joseph M. Donahue (Goodyear); *Treasurer,* Elmer E. Ross (T. C. Ashley); and *Custodian,* J. Laurence Powell (Goodrich Footwear & Flooring). Elected to the executive committee were: Donald F. Holloway (R&M Industrial Labs); B.B.S.T. Boonstra (Godfrey L. Cabot); and Juan C. Montermoso (Quartermaster Research & Engineering).

A technical meeting also was held on October 13 at which Milton J. Rhoad (Goodyear) spoke on "New Worlds of Rubber." Mr. Rhoad summarized the future growth and change of the rubber markets and discussed some of the recent developments in synthetic rubbers. Following Mr. Rhoad's talk, a motion picture describing the manufacture of styrene-butadiene rubber was shown.

Stauffer Plans Research Center

► Stauffer Chemical Co., New York, N. Y., has completed plans to build a major Research Center at Richmond, Calif., on a 10 acre tract adjacent to the present Richmond plant and research laboratories. Construction of the first unit of the new Research Center will begin in January, with completion scheduled for early 1961. Cost is expected to be about $1.6 million. The existing research facilities at Richmond will be used to expand process development and pilot plant activities.

The central building of the new unit will be of a wing-type design to facilitate future expansion and integration with other planned facilities. It will be of reinforced concrete construction and will utilize aluminum, porcelain and glass extensively as functional and design elements. The Research Center will include, initially, administrative offices; twenty laboratories for basic and application research, library, and auditorium; units for bench-scale process development, and the usual service facilities.

Auburn Rubber Moves West

► Auburn Rubber Co., Inc., Auburn, Ind., has sold its assets to the Hosdred Co., Inc., Deming, N. M., and will move to Deming early in 1960. The Indiana firm has been specializing in mechanical goods, soling materials, special services, toys and novelties. It will lend its name to the joint venture, continuing its present policies and retaining its present management and sales force. Future expansion is being underwritten by a $15 million bond issue authorized by the municipality of Deming for the project.

Borden Plans New Facilities

► Borden Chemical Co., New York, N. Y., will build a combined resins and formaldehyde unit in the San Francisco Bay area. According to the company, the resin plant will produce 50 million pounds per year of thermosetting resins and thermoplastic emulsions, while the formaldehyde plant will have a 45 million pound per year capacity.

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Financial News

Hewitt-Robins

► Nine months ended September 30: A loss of $179,870, with no per share earnings, was reported for the 1959 period, compared with a net income of $701,630, or $1.68 per share, for the like period of 1958. Net sales totaled $34,897,081, compared with $36,050,320 for the comparable 1958 period The 1959 figures include substantial nonrecurring losses and charge-offs on rubber foam products discontinued during the third quarter.

Clevite Corp.

► Nine months ended September 30: Net sales amounted to $62,448,000, compared with $46,922,000 for the like 1958 period. Per share earnings for the 1959 period equaled $2.51, compared with $1.08 for the 1958 period. Net sales for the quarter ended September 30 totaled $19,651,000, equal to 73c per share, compared with $15,048,000, or 49c per share, for the comparable 1958 quarter.

Electric Storage Battery

► Nine months ended September 30: Net income amounted to $3,807,000, equal to earnings of $2.28 per share, compared with $2,274,000, or $1.37 per share for the like period of 1958. Net sales for the nine months ended September 30 totaled $102,977,000, compared with $88,894,000 in the same 1958 period.

Seiberling Rubber

► Nine months ended September 30: Net income amounted to $1,055,352, equal to earnings of $1.56 per share of common stock, compared with $602,941, or 78c per share, in the like period of 1958. Net sales for the 1959 nine-month period totaled $41,728,669, compared with $35,597,936 during the same period last year.

New Jersey Zinc

► Nine months ended September 30: Net income amounted to $2,723,637, equal to $1.39 per share of common stock, compared with $107,655, or 5c per share for the same period of 1958. Net sales for the 1959 period totaled $14,345,841, compared with $9,111,124 during the 1958 period.

McNeil Machine & Engineering

► Nine months ended September 30: Net income amounted to $2,387,100, equal to $1.98 per share of common stock, compared with $1,147,359, or 95c per share for the comparable 1958 period.

General Cable

► Nine months ended September 30: Net income amounted to $6,394,806, or $1.98 per share of common stock, compared with $5,249,793, equal to $1.61 per share, for the comparable 1958 period. The earnings of Indiana Steel & Wire Co., Inc., acquired in 1959, are included for both periods in order to present the figures on a comparable basis.

U.S. Rubber

► Nine months ended September 30: Net income for the period came to $26,504,560, equivalent to $3.94 a share of common stock, compared with $14,235,514, equal to $1.80 per share in the same period of 1958. Net sales for the first nine months of 1959 totaled $743,230,320, compared with $607,104,417 for the comparable 1958 period.

Anaconda Wire & Cable

► Nine months ended September 30: Net income amounted to $2,759,205, equal to earnings of $3.27 per share, compared with $481,694, or 57c per share for the like 1958 period. Current figures include results of Sequoia Wire & Cable Co., a wholly owned subsidiary acquired in May, 1959, for the five months ended September 30.

Ruberoid

► Nine months ended September 30: Net income amounted to $4,847,763, equal to $2.25 per share of common stock, compared with $3,416,153, or $1.80 per share for the comparable 1958 period. Net sales for the 1959 nine months totaled $97,927,343, compared with $90,625,915 in the like period last year.

Mohawk Rubber

► Nine months ended September 30: Net income amounted to $906,000, equal to earnings of $3.68 per share of common stock, compared with $790,000, or $3.21 per share for the like period of 1958. Net sales for the 1959 period totaled $23,229,000, compared with $18,194,000 in the like 1958 period.

Mansfield Tire & Rubber

► Nine months ended September 30: Net income amounted to $1,806,219, equal to $1.28 per share of common stock, compared with $1,775,543, or $1.25 per share for the like period of 1958. Sales for the nine-month period in 1959 totaled $53,632,959, compared with the 1958 figure of $49,222,445.

Thiokol Chemical

► Nine months ended September 30: Net income amounted to $4,060,355, equal to common share earnings of 92c, compared with $1,735,581, or 43c per share for the comparable period of 1958. The figures have been adjusted to reflect a three-for-one stock split in April, 1959. Net sales for the 1959 nine-month period totaled $127,883,796, compared with $54,607,976 for the comparable period last year.

Electric Autolite

► Nine months ended September 30: Net income amounted to $5,631,773, equal to $3.59 per share of common stock, compared with $1,473,674, or 12c per share for the like period of 1958. The current figure excludes a net gain of $2,900,983, or $1.85 per share from the July 2, 1959 sales of company's investment in 322,900 shares of common stock of Crane Co.

Cooper Tire & Rubber

► Nine months ended September 30: Net income amounted to $1,004,569, or $3.02 per share of common stock, compared with $612,441, or $1.84 per share for the 1958 period. Net sales for the 1959 nine-month period totaled $27,882,158, compared with $21,859,936 for the 1958 period.

United Carbon

► Nine months ended September 30: Net income amounted to $4,949,473, equal to common share earnings of $4.01, compared with $3,752,792, or $3.04 per share for the like period of 1958. Net sales totaled $46,441,323, compared with $40,581,352 for the same period last year.

Simplex Wire & Cable

► Nine months ended September 30: Net income amounted to $575,000, or 96c per share of common stock, compared with $551,000, or 92c per share for the same period last year. Net sales totaled $24,307,000, compared with $23,245,000 for the 1958 nine-month period.

Imperial Color & Chemical

► Quarter ended September 30: Net income amounted to $455,974, equal to 45c per share of common stock, compared with $413,401, or 41c per share, in the comparable 1958 quarter. Net sales totaled $6,400,424, compared with $6,536,050 for the 1958 period.

St. Joseph Lead

► Nine months ended September 30: Net income amounted to $4,570,112, equal to earnings of $1.68 per share of common stock, compared with $2,619,416, or 96c per share for the comparable 1958 period.

Merry Christmas
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Small wonder, then, that more and more qualified teachers, dedicated but discouraged, are leaving the campus each year for better paying jobs in business and industry. And, in the face of this alarming trend, college applications are expected to double within ten years.

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According to a report of the Carnegie Foundation for the Advancement of Teaching, "This great flood of youngsters will be taught—taught well or badly. And the demand for teachers will somehow be at least partly met—if not with well-prepared teachers then with ill-prepared, if not with superior teachers then with inferior ones."

Not a very rosy picture, is it?

As a nation whose destiny depends on the maximum development of our human resources, we must put a stop to this nonsense. You *can* and *must* help. Support the college of your choice so that it can pay fair, competitive salaries to its teachers. Then encourage talented young people to pursue teaching careers.

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Connecticut Holds Sports Night

► The Connecticut Rubber Group held a Sports Night meeting on November 6 at Rapp's Paradise Inn, Ansonia, Conn. Arnold "Red" Auerbach, head coach of the Boston Celtics professional basketball team, was the guest speaker, substituting for the previously announced Bob Cousy, star player for the Boston Celtics. Mr. Auerbach kept the 150 members in attendance amused with anecdotes about his world travels, his basketball career, and happenings during games of the National Basketball Association. He also discussed the personal athletic duel between Bill Russell of the Celtics and Wilt Chamberlain of the Philadelphia Warriors.

The above photographs shows, left to right: W. H. Couch (Whitney Blake) chairman of the Connecticut Rubber Group; Arnold "Red" Auerbach, coach of the Boston Celtics; F. B. Smith (Naugatuck Chemical) group treasurer; and V. P. Chadwick (Armstrong Rubber), vice-chairman of the Connecticut Rubber Group.

Rubber Concerns Fined

► The Rubber Manufacturers Association and ten of its members were fined a total of $177,500 recently for violating the Sherman Antitrust Act. The indictment charged that the defendants had conspired in unreasonable restraint of trade to fix prices in the flat belting industry. The association and the ten firms pleaded nolo contendere to the indictment. By their plea, they accepted the charges against them, but did not indicate their guilt.

David H. Harris, Justice Department lawyer for the Antitrust Division stated that the conspiracy existed between 1949 and 1957 and "involved the entire industry." Mr. Harris said the annual production in flat belting in 1956 reached $60,000,000. He asserted that this was an important and growing industry, that the conveyor belt was a prerequisite for automation and that it "is the very heart of the mass production line."

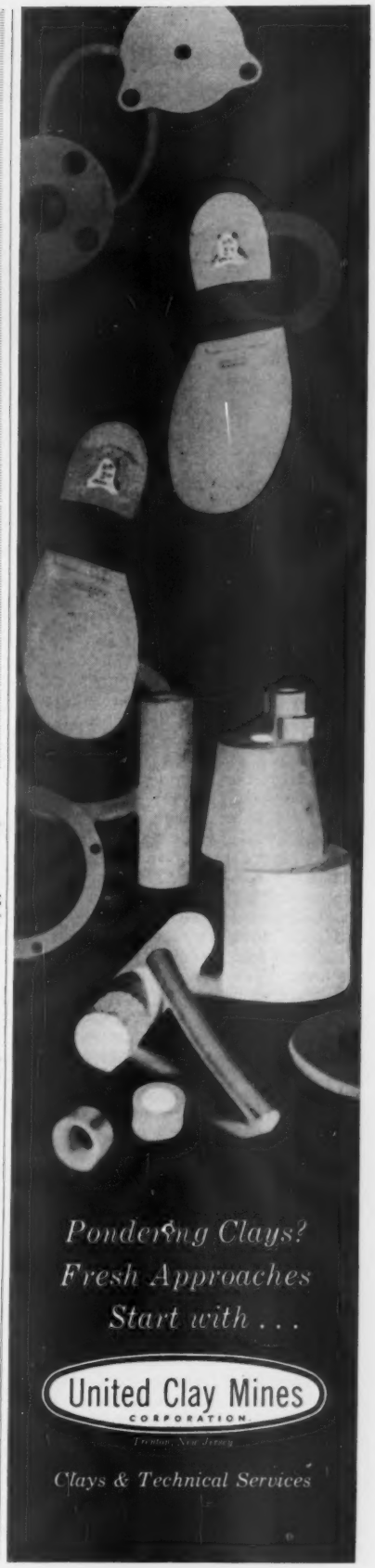
The defendents and fines imposed were as follows: The Association, $10,000; B. F. Goodrich Co., $35,000; Goodyear Tire and Rubber Co., $35,000; U.S. Rubber Co., $35,000; H. K. Porter Co., $10,000; New York Rubber Corp., $7,500; American Biltrite Rubber Co., $10,000; Raybestos-Manhattan, $7,500; Acme-Hamilton Manufacturing Corp., $5,000; Lee Rubber and Tire Corp., $15,000; and Hewitt Robins, $7,500.

Cary Chemicals Appoints Milner

► Cary Chemicals Inc. of East Brunswick and Flemington, N. J., has appointed Joseph A. Milner as purchasing agent and controller of traffic. Prior to joining Cary Chemicals, Mr. Milner was associated with both Ansonia Wire & Cable Co. and Holyoke Wire & Cable Co., where he was in charge of purchasing and material control. Mr. Milner holds a bachelor's degree in Business Administration from Northeastern University. During World War II, he served in the European Theater as a lieutenant colonel. Immediately following his discharge from the Army in 1946, he handled purchasing and contract negotiations for the Veterans' Administration for a period of eight months.

Cellusuede Flocked Paper

► A new bright green flocked paper for general decorative use has been announced by Cellusuede Products, Inc., Rockford, Ill., producers of natural and synthetic flock and flocked papers. The paper is 35 pound white Kraft and the flock is a rich green rayon fiber of sufficient length to give it a matted, grass-like appearance. This new flocked paper is ideal for window dressing purposes or for any use where grass is to be simulated. It comes in 24 yard rolls, 52 inches wide, each individually boxed for shipping.



Canadian News

► The Ninth Canadian High Polymer Forum, held at the Guild Inn, Toronto, on October 26 to 28, was attended by 142 polymer chemists from the United States, England and Canada. The Forum chariman was M. H. Jones (Ontario Research Foundation), while S. Bywater (National Research Council), H. H. G. Jellinek (Essex College), M. Rinfret (University of Montreal) and G. Olah (Dow of Canada) served as session chairmen. At the business meeting, on October 26, officers for the Tenth Forum were elected including *Chairman,* L. A. McLeod (Polymer); *Program Chairman,* K. E. Russell (Queen's University); *Secretary-Treasurer,* D. A. I. Goring (Pulp and Paper Research Institute).

Guest speaker at the Forum Banquet on October 27 was C. H. Bamford (Courtaulds), who spoke on "Patterns in Reactions and Polymers". He said that detailed information is now available concerning transfer reactions of polymer radicals with a variety of substrates. For a hydrocarbon substrate such as ethylbenzene, the rate constants for the hydrogen abstraction process involving a series of polymer radicals are fairly accurately proportional to the rate constants for the corresponding reactions with toluene. In these reactions with hydrocarbon substrates, polar factors are very small. With ferric chloride, butyl mercaptan or carbon tetrabromide as substrates, a logarithmic plot of rate constants for the transfer reaction against rate constants for the corresponding reaction with toluene gives a number of scattered points. The pattern of points is, however, very much the same in all three cases. With triethylamine as substrate an "inverse" pattern is obtained. Patterns of the first type are obtained in addition reactions involving the same polymer radicals and a number of vinyl monomers.

According to Dr. Bamford the observed patterns can be interpreted in terms of polar effects, the rate constant depending considerably on the extent to to which the substituent in the radical is electron withdrawing or electron releasing. From a quantitative treatment, Dr. Bamford concluded that it is possible to express the rate constant for the transfer reaction of a radical with a given substrate in terms of the rate constant for transfer with toluene and the Hammett π constant for the radical. Predictions based on this quantitative theory are in excellent agreement with experiment.

The technical sessions began with a paper by J. K. N. Jones (Queen's University) on "Some Problems in Polysaccharide Chemistry." In pointing out some of the difficulties involved in complete structural determinations of polysaccharides, he said that it is not always possible to decide whether traces of sugars occurring with the main hydrolysis products of polysaccharides were part of the original macromolecule. Degrees of branching can be readily obtained using the Haworth methylation technique, but frequently it is almost impossible to achieve 100 per cent methylation of a polysaccharide. The major problem in this field is to imitate the action of enzymes on sugars and sugar derivatives to produce polymers similar to those found in plants and animals.

B. L. Funt and F. D. Williams (University of Manitoba) in their paper on "Retardation and Inhibition of Methyl Methacrylate Polymerization," described investigations of the effect of benzoquinone on methyl methacrylate polymerization using C^{14} tagged quinone and initiator. They observed a transition from retardation to inhibition at a critical concentration of benzoquinone. The Monday morning session closed with a short color film on polymer interactions made available by W. F. Busse, DuPont Co., Wilmington.

The first in a series of papers on polymer degradation was given by H. A. Kraessig and J. Neal (Industrial Cellulose Research) who discussed "The Degradation of Cellulose by Megavolt Electrons." They showed that at low dose rates, the number of chemical bonds broken is a linear function of the dose, and the sensitive volume corresponding to cleavage of a single bond is close to the volume of a monomer unit. Experiments on wet cellulose indicate that water has a considerable protective action. H. H. G. Jellinek (Essex College) and W. A. Schlueter described work performed at the University of Cincinnati on "The Photodegradation of Polyacrylonitrile in Solution" using light of wavelength 2537Å. The rate of degradation in vacuo is proportional to the light intensity and the number of broken bonds is less than 10^{-3} per quantum absorbed.

W. C. Schneider (American Cyanamid) spoke on "The Thermal Stability of Polyacrylonitrile." At 240° in the absence of oxygen, he observed, the polymer breaks down very rapidly giving a complex mixture of products. In the presence of oxygen, a more controlled reaction gives water, ammonia and hydrogen cyanide as the only volatile products. J. R. Schaefgen (DuPont) presented a paper on "The Thermal Degradation of Poly-p-xylylene." The rate of degradation was measured in a chlorinated aromatic solvent in the range 285-321°. Degradation is random and the activation energy is 58 kcal/mole. Anthracene decreased the rate of degradation but common transfer agents are inactive.

R. J. Orr (Polymer) presented a paper on "Thermochemical Aspects of Free Radical Butadiene-Styrene Copolymerization." A treatment of the thermodynamics of copolymerization has been devised which can be applied to high conversion material. The sum of the entropy changes for the two heteropolymerization steps was found to be about 50 e.u./mole assuming that the residual entropy contributed by the glassy state is zero.

C. Booth and L. R. Beason (Shell Chemical) gave a paper on "Statistical Treatment of Polymer Fractionation Data." A styrene-butadiene copolymer was fractionated and the fractionation data subjected to a simple binomial analysis. The resulting molecular weight distribution was in good agreement with that calculated from the kinetics of the emulsion system. J. A. Manson, W. W. Graessley and L. M. Hobbs (Air Reduction) described "The Determination of the Breadth of Molecular Weight Distribution in Polyethylene by an Irradiation Technique." Samples of high pressure and low pressure polyethylene were irradiated using a cobalt-60 source and were analyzed for soluble and gel fractions. From the results, it is possible to calculate weight and number average molecular weights of the original polyethylene samples.

A. Rezanowich and D. A. I. Goring (Pulp and Paper Research Institute) have investigated "The Polyelectrolyte Properties of a Lignin Sulfonate Microgel." Their measurements of the polyelectrolyte expansion of fractions of sodium lignin sulfonate indicate a microgel structure for the macromolecule. They developed a theory assuming that the microgel structure has free charges only on the surface and showed that it agreed fairly well with experiment. D. J. Worsfold and S. Bywater (National Research Council) spoke on "Some Properties of Poly - α - Methylstyrene produced by Anionic Polymerization." They have made a thorough molecular weight analysis of poly-α-methylstyrene samples produced using sodium naphthenide as catalyst. One important result is the intrinsic viscosity-molecular weight relationship for polymer samples of very sharp distribution.

M. Senez and H. Daoust (University of Montreal), in their paper on "Heat Parameters for Polyisobutylene Solutions," compared heat parameters determined for the polyisobutylene-chlorobenzene system by calorimetry and by the viscosity method of Fox and Flory. The data fit the Fox and Flory treatment of viscosity data. W. Heller and M. Nakagaki (Wayne State University) in "The Exact Theory of the Scanning Method for Determining Particle Sizes from Light Scattering"

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CONTAINS:

2365 rubber compounds on individual punched cards presorted first by polymer, then each polymer grouped into black and nonblack subgroups, further subdivided by hardness and then by tensile.

115	compounds	for natural rubber, black
154	"	for natural rubber, nonblack
276	"	for styrene rubber, black
150	"	for styrene rubber, nonblack
259	"	for nitrile rubber, black
97	"	for nitrile rubber, nonblack
254	"	for neoprene, black
116	"	for neoprene, nonblack
101	"	for butyl, black
57	"	for butyl, nonblack
50	"	for polysulfide, black and nonblack
36	"	for reclaim (all black compounds)
45	"	for Hypalon, black and nonblack
86	"	for silicone rubber, black and nonblack
92	"	for vinyls (all nonblack compounds)
100	"	for miscellaneous other rubbers, black and nonblack
156	"	for blends of general purpose rubbers (natural, styrene, butyl, reclaim), black
71	"	for blends of general purpose rubbers, nonblack
77	"	for blends containing oil-resistant rubbers, black
73	"	for blends containing oil-resistant rubbers, nonblack
2365	compounds	Total

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gave accurate calculations of the angular positions of maxima and minima for non-absorbing spheres for the large relative refractive index of 1.20. The results for other relative refractive indices can now be calculated fairly readily.

T. Gillespie (Dow Chemical) presented papers on "The Limited Flocculation of a Colloidal System by a Water Soluble Polymer" and "The Rheology of a Polystyrene Latex Thickened with Methylcellulose." His results on the flocculation of styrene-butadine latex by methylcellulose indicate that the stabilization of a hydrophobic colloid by a hydrophilic colloid is due to changes in the balance of the flocculation and defloccation processes. Methylcellulose thickens a polystyrene latex by causing a reversible partial flocculation. A. Novak and E. Whalley (National Research Council) presented data on "The Infra-red Spectrum of Polyformaldehyde" and showed that these data could be interpreted on the assumption of a helical model for the polymer.

E. H. Immergut, G. Kollmann and A. Malatesta (Dunlop Research Centre) reported results on "The Cationic Copolymerization of Propylene and Isoprene." They prepared soluble copolymers under carefully controlled conditions using aluminum chloride as a catalyst at —78° (molecular weight range 4,000-10,000). Reactivity ratios for propylene and isoprene are approximately 0.23 and 0.5. M. H. Jones, U. Martius and M. P. Thorne (Ontario Research Foundation) discussed "The Polymerization of 1-Butene by Metal Alkyl-Titanium Halide Catalysts." They reported the results of chemical and X-ray analyses of the complex catalysts produced by the interaction of aluminum triisobutyl or lithium n-butyl with titanium trichloride or tetrachloride. Kinetic results for the polymerization of butene-1 using aluminum triisobutyltitanium trichloride were given; the products were of very high molecular weight (intrinsic viscosity between 5 and 6).

C. H. Bamford in a paper on "Termination by Primary Radicals in Vinyl Polymerization" said that when the initiator concentration is high, a plot of rate of polymerization of styrene versus monomer concentration is curved. This can be quantitatively accounted for by assuming termination of some growing polymer radicals by primary radicals from the initiator. The velocity constant for primary radical termination is about 60 times that for mutual termination. The interaction of unlike radicals was also discussed by C. Sivertz and Y. Ebisuzaki (University of Western Ontario) in a paper on "The Measurement of the Cross-Termination Velocity Constants for Picrylhydrazyl and Alkyl Radicals." They studied the thermal decomposition for azobisisobutyronitrile at such low concentrations that the combination of free cyano-alkyl radicals competed with the reaction with diphenylpicrylhydrazyl. The relationship between the two velocity constants was derived.

L. E. Coleman and J. F. Bork (Lubrizol) spoke on "The Reactivity Ratios of N-Vinyl Oxazolidone and N-Vinyl Pyrrolidone with Vinyl Monomers." N-Vinyl oxazolidone copolymerizes well with vinyl chloride and vinyl acetate but not with styrene and methyl methacrylate; N-vinyl pyrrolidone is more reactive than N-vinyl oxazolidone. W. E. Walles, W. F. Tousignant and T. Houtman (Dow Chemical) have studied "Poly-N-vinyl, 5-methyl, 2-oxazolidone (PVOM) a New Complexing Polymer." PVOM of molecular weight 150,000 is soluble in water below 40° and insoluble at higher temperatures. This behavior is explained in terms of a change from a structure which presents largely hydrophilic groups to the solvent to one which is almost entirely hydrophobic.

R. J. Ceresa and F. H. Cotton (National College of Rubber Technology, London) in presenting a paper on "The Mechanico-Chemical Modification of High Polymers" said that cold mastication of elastomers in the presence of 0.1 per cent aluminum isopropoxide eventually leads to gels; under similar conditions a mixture of polyvinyl acetate and polyethylene may give a fair yield of block copolymer. R. J. Richardson (Atomic Energy of Canada) spoke on "Radiation Grafting of High Polymers." Nylon tenting fabric was irradiated with gamma rays in the presence of styrene to give polystyrene grafts largely on the surface of the nylon, with a resultant improvement in its weathering properties. Irradiation of nylon and terylene in the presence of acrylonitrile and vinyl pyrrolidone gave a slight improvement in dying response.

J. R. Tichy (Maine Medical Center) in his paper on "The Polymerization of Phosphorus Pentachloride and Urea" presented analytical data on the products of this complex polymerization. In the last paper presented, R. W. Lenz and W. K. Carrington (Dow Chemical) discussed "The Preparation of Phenylene Sulfide Polymers by the Macallum Polymerization." The reaction of p-dichlorbenzene with sulfur and sodium carbonate at 300-350° to give a high molecular weight phenylene sulfide polymer probably proceeds partly by a direct attack of sulfur diradicals on the dihalide and partly by attack of sodium sulfide formed by reaction of sulfur with sodium carbonate.

► E. W. Ryan has been appointed superintendent of the Latex and Reclaim Division for Dominion Rubber Co., Ltd., in which position he will be responsible for production, services and industrial relations. Mr. Ryan has been associated with Dominion Rubber for 31 years.

West Coast News

► Stauffer Chemical Co., New York, N. Y., has acquired General Foam Products, Los Angeles, Calif. The firm, which manufactures a range of expanded polystyrene under the brand name of Crest-Foam, will be operated as a unit of Stauffer Chemical's Molded Products Division. Officers of General Foam Products include Charles A. Lindsay, president; John Stauffer, vice-president; and Joseph J. Burris, secretary. Frederick N. Cartan has been appointed manager.

General Foam Products produces Crest-Foam expanded polystyrene in both self-extinguishing and regular grades, in expanded bead, billet, board and special shapes. Major uses are as low temperature insulation board for the construction of commercial cold storage buildings (e.g. food and meat processing plants, breweries, dairies) and refrigerated railroad cars and trucks. It is also used as an structural and insulating element.

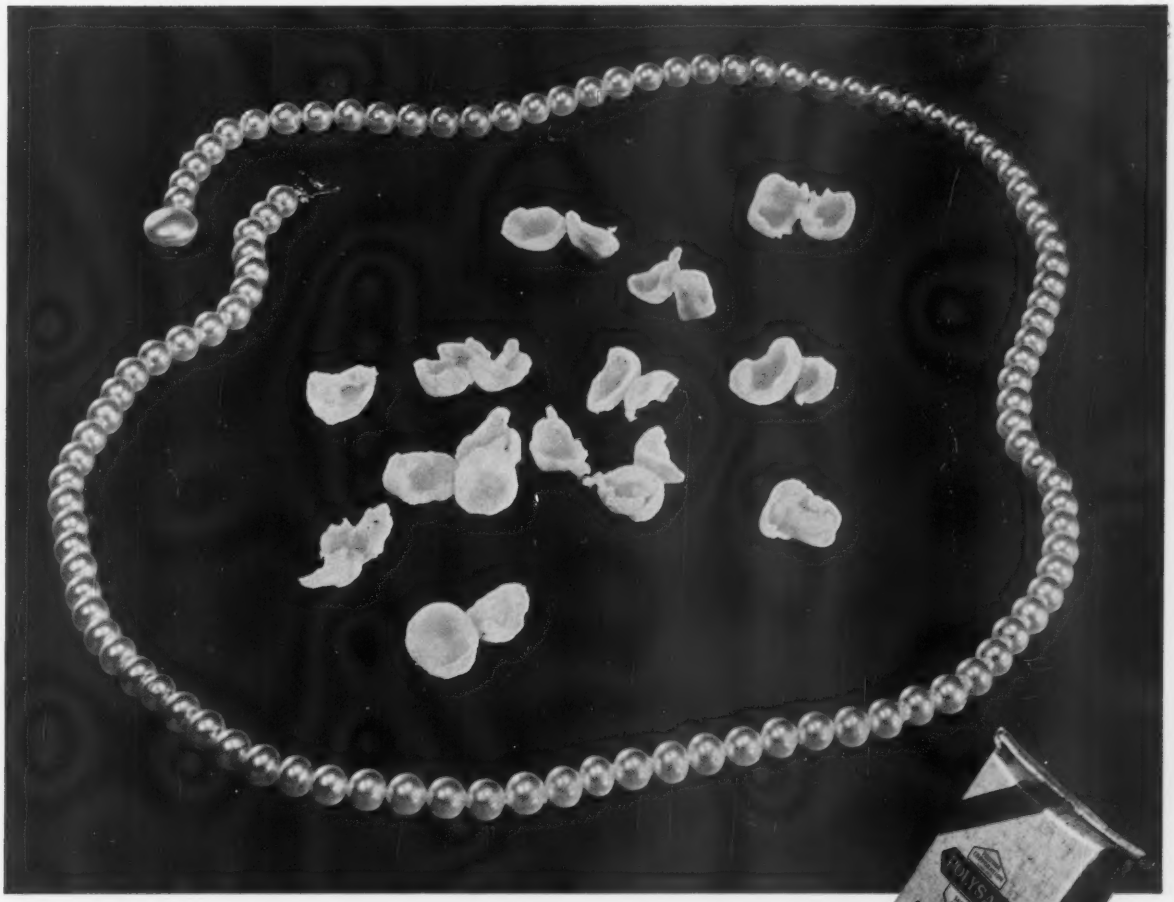
► The Los Angeles Rubber Group, Inc., held its 22nd annual Christmas party on Friday, December 11, at the International Ballroom and Lounge of the Beverly-Hilton Hotel. The program included a social hour, dinner, a show, dancing and the introduction of officers for 1960.

Officers include: *Chairman,* B. R. Snyder (R. T. Vanderbilt); *Associate Chairman,* W. M. Anderson, (Gross Mfg.); *Vice-Chairman,* Charles M. Churchill (Naugatuck Chemical); *Secretary,* John L. Ryan (Shell Chemical); and *Treasurer,* L. W. Chaffee (Ohio Rubber). Directors will be C. F. Ashcroft (Cabot); A. J. Hawkins (DuPont); Charles H. Kuhn (Master Processing); A. P. Marone (Witco); H. W. Sears (Stillman Rubber); R. L. Wells (Firestone); and R. O. White (Caram Mfg.).

Several new members have joined the group including F. L. Hopper, G. G. Zirges and W. H. Miller (Firestone); Leonard Bronte (Vinylloyd); J. H. Turner (Atlas Powder); S. T. Raycraft and W. L. Patchen (Shell Chemical); H. B. Butler (Ratliff Rubber); J. S. Aubrey (Monsanto Chemical); D. M. Clark (Neville Chemical); C. T. Clark (Goodyear); and H. V. Rogers (California Rubber).

► A new laboratory and plant office building for the Witco Chemical Co., New York, N. Y., is now under construction in Los Angeles, Calif. Located on the site of two Witco plants, an Organic Chemicals Division operation for metallic stearate production and an ultra chemical sulfonation unit, the installation will provide both with expanded and modernized laboratories for control and customer services.

Polysar **SS 250** FLAKE



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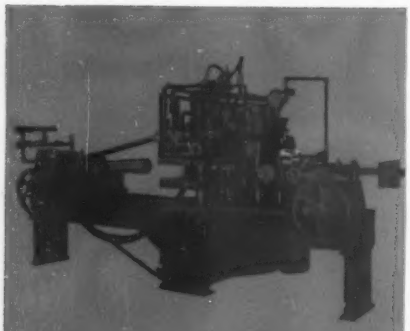

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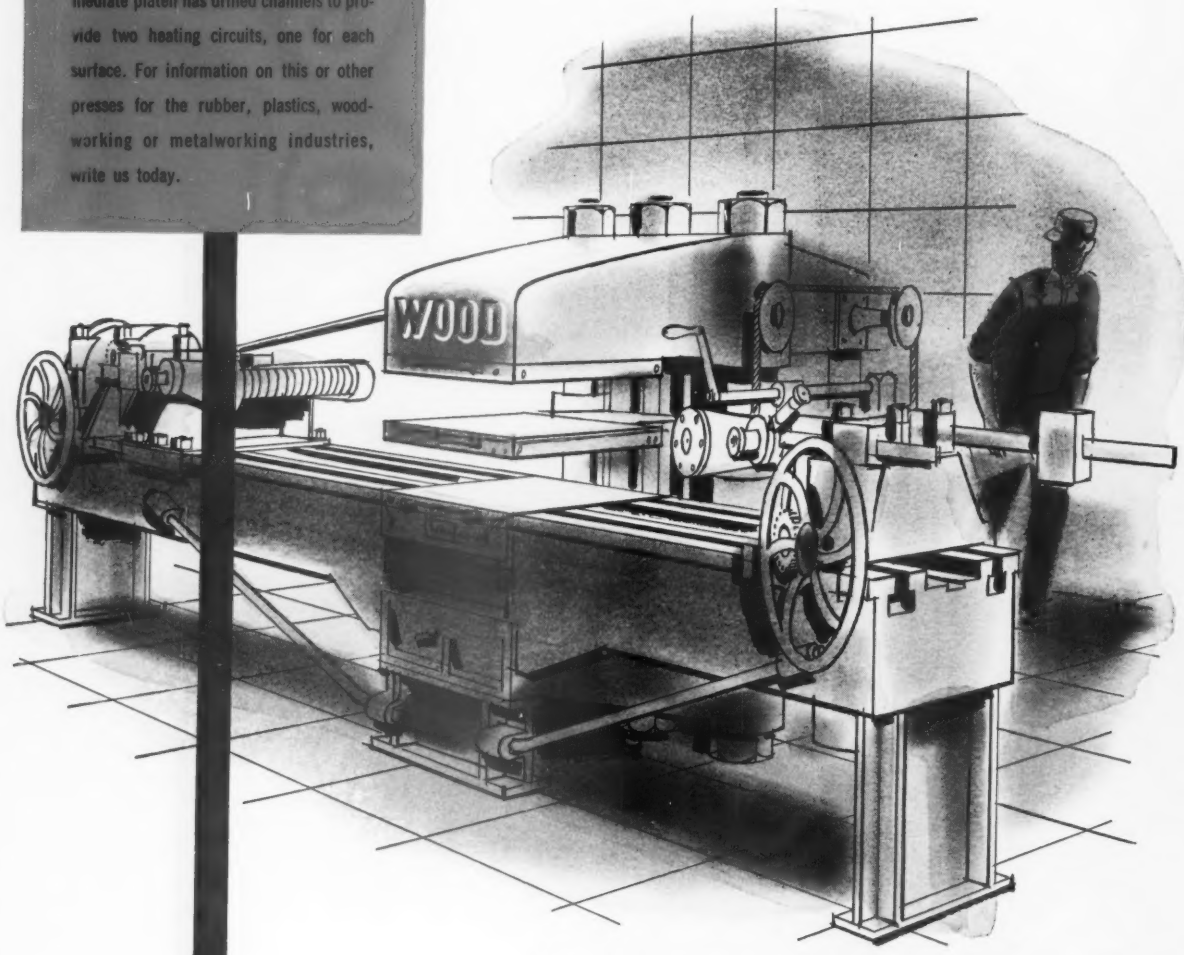

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25-75	2,440 psi	2,200 psi	2,120 psi	2,020 psi
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	Super Multifex	Multifex-MM	Super Multifex	Multifex-MM
50-50	270 pit	240 pit	300 pit	225 pit
25-75	225 pit	200 pit	240 pit	200 pit
0-100	200 pit	175 pit	220 pit	200 pit

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Obituaries

Henry P. Kendall

► Henry P. Kendall, board chairman of the Kendall Co., manufacturers of surgical dressings, gauze and many allied products, died on November 3 at his home in Sharon, Mass. He was 81 years of age. Mr. Kendall graduated from Amherst College in 1899. He started the company which bears his name in 1903. In 1916, he purchased the Wateree Mill in Camden, S.C., and in that year also the Curity trademark appeared on Kendall products. Mr. Kendall changed the sales of cheesecloth from a by-the-bolt-system to a by-the-package method, making it easily available to the consumer. In World War I, when he was on the War Industries Board, he played a major role in marshalling national resources to produce surgical dressings. In 1928, he purchased Bauer & Black and in 1929, acquired the Bike Web Co. After World War II, Mr. Kendall directed his company into a program of great diversification, including the manufacture of pressure-sensitive industrial tapes and polyethylene protective coatings, as well as foam rubber products. He is survived by his wife, two sons and a daughter.

Floyd C. Snyder

► Floyd C. Snyder, chairman of the board of directors of Ace Rubber Products, Inc., Akron, Ohio, died on October 28 in City Hospital, Akron. He was 77 years old. Mr. Snyder headed Ace Rubber since its founding in 1935, and had been president of its predecessor, American Rubber and Tire Co. At the time of his death, he also was president of American Storage and Transfer Co., Akron, Ohio. Mr. Snyder graduated from Cornell University in 1905 with degrees in mechanical and electrical engineering. During his long business career, Mr. Snyder had served as chief executive or director of a number of Ohio concerns. In 1958, he relinquished the presidency of Ace Rubber, but continued to serve as chairman until his death. He is survived by a son.

Roland Reppert

► Roland Reppert, vice-president in charge of marketing for the American Hard Rubber Co., died on September 28. He was 62 years old. Mr. Reppert, a graduate of the New York University School of Business, served in the United States Navy during World War I. He was active in civic affairs for many years. Surviving are his wife and two daughters.

Robert B. Gardner

► Robert B. Gardner, vice-president and general manager of Goodyear International Corp. Pathfinder Rubber Estate operation in the Philippine Islands, died on November 11 in Manila, P. I. He was 38 years old. Mr. Gardner became associated with Goodyear in 1943 as a foreign service trainee in Akron, Ohio, following his graduation from New Hampshire University. In 1945, he was assigned as a staffman for Goodyear-India. In 1948, he was transferred to Singapore as office manager of Goodyear Rubber Plantations Co., later becoming manager of operations in Malaya and Singapore. Early in 1959, he was appointed vice-president and general manager of the Philippine plantation operations. He is survived by his wife and two sons.

Fred C. Fernald

► Fred C. Fernald, retired general counsel and vice-president of Godfrey L. Cabot, Inc., died at his home in Boston, Mass., on October 23, after a heart attack. He was 66 years old. Mr. Fernald retired from the Cabot firm last year after having served as general counsel for 32 years. He had been active as a consultant since retirement. Mr. Fernald was a member of the American Bar Association and had served on a number of its committees. He is survived by his wife and a daughter.

Vincent Richards

► Vincent Richards, a famous tennis player and the vice-president of the Sports Division of the Dunlop Tire and Rubber Co., died of a heart ailment at Doctors Hospital on September 26. He was 56 years old. Mr. Richards was born in New York and attended Fordham Preparatory School, Fordham University and the Columbia University School of Journalism. He won many honors as a tennis player and was the only Olympic tennis champion in history. He is survived by a daughter and two sons.

Thomas Matchett

► Thomas Matchett, retired president of the Robins Conveying Belt Co., died on September 28 in Passaic General Hospital after a short illness. He was 77 years old. Mr. Matchett became factory manager for the Republic Rubber Co., Youngstown, Ohio, in 1906. In 1914, he became vice-president and general manager of Robins and in 1926, its president. He retired in 1945. Surviving are his wife and a son.

Harvey Fife

► Dr. Harvey Reem Fife, a research chemist at the Mellon Institute since 1927, died on October 22 in Chapel Hill, N. C. He was 58 years old. Dr. Fife graduated from Morris Harvey College in 1923, received an M. S. degree from the University of West Virginia in 1925 and did further graduate work at the University of Chicago, New York University and the University of Pittsburgh. He was awarded an honorary doctorate by Morris Harvey College in 1952. At the Mellon Institute, where he worked under a grant from the Union Carbide Chemicals Co., Dr. Fife did research in solvents, plasticizers, resins, synthetic lubricants, coal and hydraulic fluids. One result of his research was a method of coating bituminous coal with petrolatum to keep it free from dust during shipping, storage, delivery and stoking. Dr. Fife is survived by his wife and a daughter.

Thomas B. Crowell

► Thomas B. Crowell, executive vice-president of Copolymer Rubber and Chemical Corp., Baton Rouge, La., died on November 2 at his home in Baton Rouge following a lengthy illness. He was 51 years of age. Mr. Crowell received a B. S. degree in chemical engineering from Clarkson College of Technology in 1929. Prior to joining Copolymer in 1943, he was employed by American Cyanamid Co. He had served in many capacities at Copolymer, including shift supervisor, assistant chief engineer, production superintendent, production manager, and vice-president and general manager. He was named executive vice-president in 1958. Mr. Crowell was a director of the Baton Rouge Chamber of Commerce, the Baton Rouge Rotary Club and the City Club. He is survived by his wife, three daughters and a son.

John J. Conners

► John J. Connors, executive vice-president of the Bishop Manufacturing Corp., died of a heart attack on October 2. He was 57 years old. Mr. Connors, a graduate of Cooper Union in New York City, had been general sales manager of the Irving Varnish and Insulating Co. before he joined Bishop Manufacturing. He was a member of the American Institute of Electrical Engineers. Surviving are his wife and three daughters.

Edward W. Furst

► Edward W. Furst, retired general manager of the Grasselli Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., died on August 26 at his home in Swarthmore, Penna. He was 84 years old. Since his retirement in 1942, Mr. Furst had been a trustee of Gettysburg College. He is survived by his wife and a son.

ROSS
Air Systems

Engineered Atmospheres for Better Processing

This refers to a foam rubber processing installation . . . a 65 foot long by 8 foot wide Ross Continuous Dryer and Curing Unit for drying C-Foam mattresses, furniture and aircraft cushions at the American Latex Corp. plant, Hawthorne, California.

Twenty minutes of the 45 minutes total continuous processing time are critically important because it is the curing period. Here is where the carefully conceived and controlled 'Engineered Atmosphere' comes into the picture. The temperature in this zone has to be held very close to 240°F by specially designed introduction, circulation and exhausting of hot air. Timing of travel has to be just right.

20 critical minutes at 240°F

Approaching the discharge end comes a complete reversal . . . a cooling zone, where residual hot spots, which could cause spontaneous combustion of the material in storage, are eliminated by the controlled introduction and circulation of cool air.

In this installation, there are at least four important elements of an 'Engineered Atmosphere' : zoning, circulation of hot air, temperature control and cooling . . . all precision problems. Drying, curing, baking, impingement, heating, cooling . . . these are typical of the operations on which Ross Engineers have concentrated their skills for more than thirty-seven years.

J. O. ROSS ENGINEERING

Division of Midland-Ross Corporation

730 Third Avenue, New York 17, N. Y.

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STOP "SCORCHING"

Get COOLER Mixing
Better Dispersion
Bigger Banbury loads with

RECLAIMATOR

Profit-building RECLAIMS

● Scorched compounds cost you money, time and frayed nerves. With RECLAIMATOR Reclaims, you get cooler mixing, better dispersion and right plasticity. Moreover, you get higher **output** because of 10% greater batch size **and** 1-½ more batches per Banbury hour !

Let us know your specific compounding problems.

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P.O. BOX 365 BUFFALO 5, N. Y.

New Goods

Vinyl Window Sheeting

► Toch Brothers, a division of Standard-Toch Chemicals, Inc., 2600 Richmond Terrace, Staten Island, N. Y., reports the development of an economical method of eliminating glare and heat through the use of a special vinyl sheeting on windows ranging in sizes up to 48 x 72 inches. According to the company, the vinyl sheeting, called Tox-Shade, is highly durable and effec-

tively screens out fatigue-producing glare in work areas and prevents excessive temperature build-up from direct exposure to sunlight. Toch Brothers claim that the vinyl sheeting is considerably more economical than conventional window shades or venetian blinds, and does not require the constant maintenance and replacement normally required by these dust collectors. The sheeting is available in several transparent, translucent and opaque colors, and is furnished custom cut to exact window dimensions. It is applied without adhesive by simply squeegeeing to the pane of glass, producing a perfect bond that will last as long as required, the company states. In spite of severe extremes of heat or cold, Tox-Shade maintains its original bond, does not become brittle and is as washable as glass itself, the company reports.

Crash-Resistant Fuel Tank

► A crash-resistant fuel tank has been developed by Goodyear Tire & Rubber Co., Akron, Ohio. According to reports, the new tank, called the Safety Cell, has undergone exhaustive testing, in cooperation with the Federal Aviation Agency, and has successfully withstood impacts exceeding 30 G's—the maximum level of human tolerance. The Aviation Products Division of Goodyear is producing the new Safety Cell for the U.S. Army YHC-1A helicopter and the Army H-21 helicopter. The tank is constructed of rubberized nylon.

R. A. B. R. M.

Technical Manuals

Conductive Rubber: Its Production, Application and Test Methods

by R. H. Norman

(RABRM Manual No. 1)

The first of several technical manuals produced by staff members of the Research Association of British Rubber Manufacturers, this publication surveys a whole mass of results and presents the main conclusions in a form which can be readily used by the industry. The manual deals extensively with the conductive and antistatic classes of rubber. The effects of stress, time and other variables on resistivity are covered as are test methods and the uses of conductive rubber. A complete index is provided. 99 pages.

$3.50

Ebonite: Its Nature, Properties and Compounding

by J. R. Scott

(RABRM Manual No. 2)

A mine of basic information which will enable the manufacturer of hard rubber (ebonite) to provide products that will give the best possible service. It gives the results of investigations into the dependence of mechanical, electrical and other properties on composition, vulcanization, etc. It covers such subjects as improving the resistance to "plastic yield" and reducing surface deterioration in light. Resistance to swelling action of organic liquids and solvents is also discussed. 294 pages.

$8.00

Analysis of Rubber and Rubber-Like Polymers

by W. C. Wake

(RABRM Manual No. 3)

The first modern work devoted solely to this important subject to be published in the English language. In addition to an analysis of natural and synthetic rubbers, the author deals with polyethylene, PVC, PVDC, PVA and the polyurethanes. Also discussed are the identification of compounding ingredients used in these polymers. This thorough and useful work will unquestionably become a standard and is a must for all interested in the analysis of rubber and rubber-like polymers. 250 pages.

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New York 1, New York

Please send me: ☐ Conductive Rubber @ $3.50 ☐ Ebonite @ $8.00
☐ Analysis of Rubber @ $8.00

☐ Payment Enclosed ☐ Bill Me

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COMPANY .....

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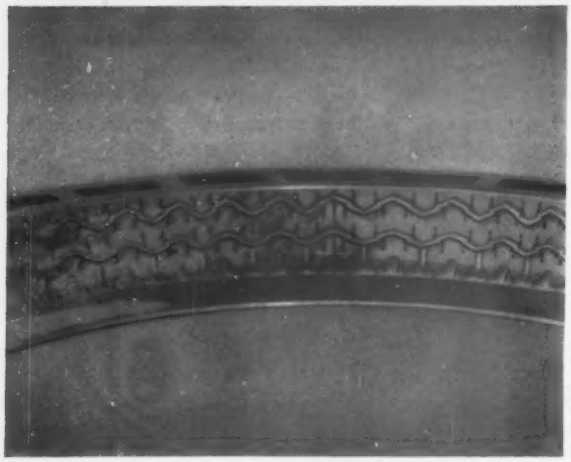
MARK II

DE-SCALED AND BLENDED THIS MOLD IN 30 MINUTES!



Product: Rubber oil seals & O-rings. Mold; manufacturer's name on request.

WHAT IS THE MARK II?

Vacu-Blast's ***Industrial Dry Honer***® model for the molded rubber products industry...the only honing machine that delivers its fine impact cleaning material in a dry air stream. Does a better cleaning job...faster!

Cleaning molds more quickly means slashing your non-productive labor costs...and also reducing non-profit down time on presses.

Molds cleaned more thoroughly, and left with a uniform satin finish, are proven to give a superior final product.

These are just a few of the Mark II Dry Honer's advantages. There are others. Get the full story by writing today for complete specifications literature—to:

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BELMONT, CALIFORNIA ABILENE, KANSAS

THIS HANDY COUPON WILL BRING COMPLETE DETAILS BY RETURN MAIL!

COMPANY NAME

MAIL ADDRESS

CITY & STATE

SEND TO PERSONAL ATTENTION

TITLE

A1259

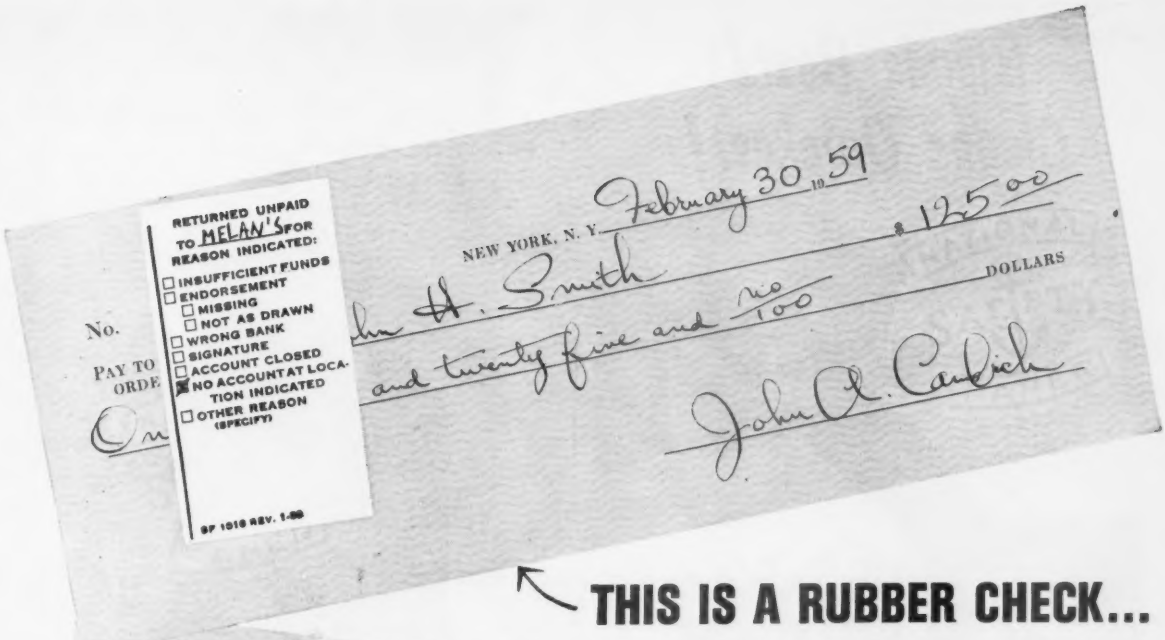
Water Ski Jacket

► A new safety jacket, said to be the first specifically designed for water ski jumpers, has been introduced by the Jones & Yandell Manufacturing Co., Canton, Miss. The jacket has been tailored to offer greater freedom of action and safety for water ski enthusiasts. Shoulder straps ride high, and a deep cut under the arm affords good arm movement.

The jacket is made of a highly buoyant vinyl sponge material called Ensolite, developed by the U. S. Rubber Co. Thousands of nitrogen-filled cells, isolated from one another, give the material its floating power. A vinyl dip covering provides the jacket with a glossy white finish. The company also points out the jacket's resistance to battery acid, gasoline and oils, and the fact that it does not heat up with exposure to the sun. It comes in small, medium and large sizes.

Anaconda Silicone-Teflon Magnet Wire

► Anaconda Wire and Cable Co., 25 Broadway, New York 4, N. Y., has announced the development and production of Silicone-Teflon magnet wire with nickel-plated copper conductors. The product is an organic film-coated magnet wire for continuous operations at 250°C. According to Anaconda, the new wire is being used successfully in transformers, solenoids, miniature relays and motors. The properties of the magnet wire include low dielectric constant and dissipation factor. Its outstanding flexibility and adherence permit it to be handled in the same manner as conventional film-coated wires. The company claims that the wire has excellent resistance to solvent attack by most acids, alkalies and hydrocarbons. Anaconda Silicone-Teflon wire is available in round sizes, No. 15 AWG through No. 36, in both single and heavy film thicknesses.



THIS IS A RUBBER CHECK...

...AND SO IS THIS

It's your job to make a profit . . . to help write rubber checks like the second one. That's why we think you might want to know more about Di-cup®, Hercules dicumyl peroxide. Di-cup is one of the most versatile vulcanizing agents to be developed since sulfur and it may offer both processing and cost saving advantages. We'd like to tell you more about how Di-cup might meet your specific requirements. Why not write to Hercules for our latest technical bulletins.

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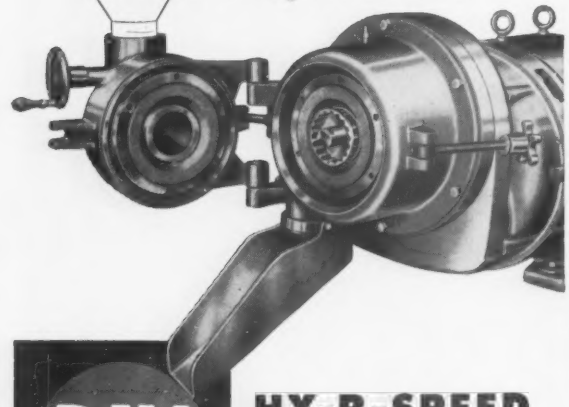
Blends Best!
Cleans Quickest!



DAY HY-R-SPEED MILLS

Three sizes: 150-300 gal/min; 100-200 gal/min; 10-20 gal/min. *Write for Bulletin 1057.*

The J. H. DAY Co.
Division of The Cleveland Automatic Machine Co.
4918 Beech Street, Cincinnati 12, Ohio

Don't let SCORCHED RUBBER spoil your day!

Scorched rubber is a needless waste. Temperature can be controlled when known. Make the use of Cambridge Surface Pyrometers routine procedure in your plant. There are models that are ideal for checking temperature during calendering, mixing, extruding and molding. Each instrument is accurate, rugged and quick-acting, and takes the guesswork out of surface temperature determination.

Combination and single-purpose instruments.

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CAMBRIDGE
ROLL • NEEDLE • MOLD
PYROMETERS

THEY HELP SAVE MONEY AND MAKE BETTER RUBBER

Garlock Rubber Sleeve Insulator

► Tough rubber sleeve insulators, being used to insulate the outer case from the solid fuel of rockets and missiles, have been developed by Garlock Packing Co., Palmyra, N. Y. The sleeve is made of a rubber compound developed by the Naval Research Board. The company reports that

without this insulation, the intense heat and velocity of the propellant would burn through the motor casing causing complete failure of the missile. The insulator is currently being used in the U.S. Navy's submarine-launched Polaris missile. Garlock reports that it also has developed a filament-wound chamber to encase the insulator and propellant. The chamber must be able to withstand the tremendous pressures of the controlled explosion of the rocket engine, the company states.

Surety SolvaSeal Glove

► A new SolvaSeal Coated Fabric Glove, developed by Surety Rubber Co., Carrollton, Ohio, has been specially designed and treated for safe, effective handling of ketones, acetones and other paint stripping compounds and other hard to handle solvents. The gloves are lightweight with curved fingers, wing thumb construction and blunt finger ends for complete hand comfort. SolvaSeal Gloves are available in women's 11 inch and men's 12 and 14 inch gauntlet style, all in a cherry red color.

Martin Rubber Muscle Builder

► Martin Rubber Co., Long Branch, N. J., has announced that it has started manufacturing and distributing its Muscle Builder, a rubber exerciser, which has not been available on the market for the past several years. The rubber exerciser is distributed in a polyethylene package.

REMEMBER WHEN VINYL
SMELLED LIKE VINYL?

Today Rhodia "odor engineering" helps put maximum sell into modern Vinyl products these two ways:

1. Rhodia deodorants that neutralize the malodor of plasticizers.
2. Rhodia fragrances that both overcome objectionable odor and add a slight appropriate scent. For example–leather aromas for leather grain Vinyls; pleasing fragrances for household products like draperies and tablecloths.

Costs are slight. Sales increases can be significant. Why not consult Rhodia on your problem? Call, write or use the coupon for additional information.

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Please send additional information on:
☐ Rhodia deodorizing agents for Vinyl.
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They'll Quickly Pay for Themselves --IN YOUR PLANT

- HOLMES ROTARY STOCK CUTTER
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Stanley H. **HOLMES** Company

Hydraulic Presses Since 1901

3300 W. Lake St. Chicago 24, Ill.

Patch Type

HOUSEHOLD OR INDUSTRIAL GLOVE FORMS

For Immediate Delivery

You can get these beautiful Porcelain Glove Forms as the need arises. These are curved finger forms with oval base, and come in sizes small, medium and large. The finish is glaze, bisque or "rough." The quality *never changes.*

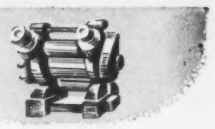
Why not let us make you a special decorative design that will be significantly YOURS? We can make forms from your own design, or we can make a special design for you.

Write or Wire

GENERAL PORCELAIN MFG. CO.

TRENTON 8, NEW JERSEY

New Equipment



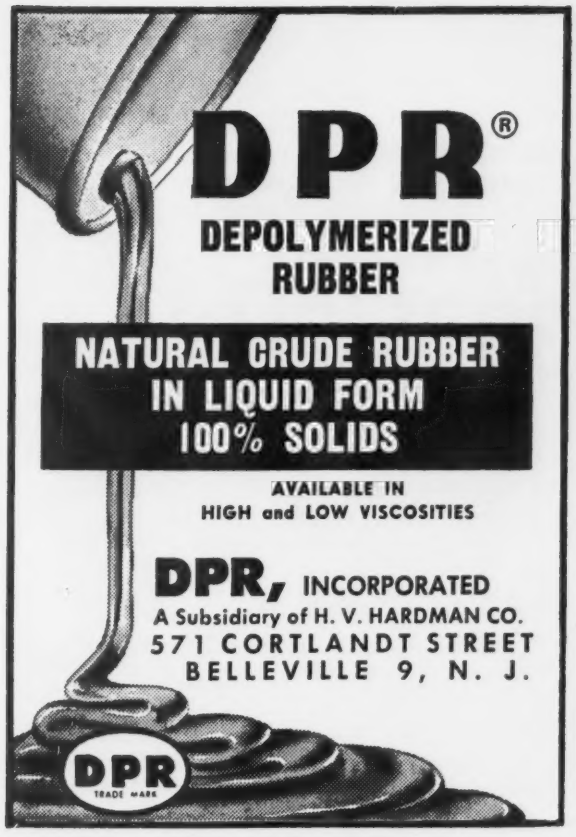
Delaware Hydraulic Presses

► Production and laboratory rubber molding can be handled by Series 300 Hydraulic Presses, developed by the Hydraulics Div., Delaware Valley Manufacturing Co., Inc., 3576 Ruth St., Philadelphia 34, Penna. Both platen closing speed and hydraulic pressure of the presses are adjustable and may be preset for compression or transfer

rubber molds. Fully encircled bronze column guides are said to assure parallel movement of platens and perfect alignment of molds. Chrome plated columns have been designed for maximum rigidity and minimum wear and a chrome plated ram for extended packing life. Special features are available in addition to 13 standard models with platen sizes ranging from 14 x 14 inches to 24 x 24 inches, and capacities from 25 to 300 tons.

Automated Viscometer

► Viscosity tests are performed automatically by a Viscometer produced by Scott Testers, Inc., 85 Blackstone St., Providence, R.I. The machine, designated the Mooney Viscometer, records the results of tests performed according to preset controls, shutting itself off after a specified time lapse or viscosity rise. The company states that 75 per cent of operator's time may be saved by adding the automated feature to their present STI and NBS models. Readings are given in Mooney point values in accordance with ASTM methods.



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WHITING (CALCIUM CARBONATES) LOW COST RUBBER FILLERS
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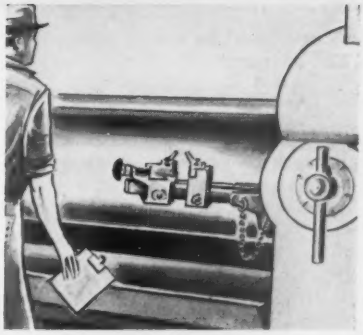
Accurate, Cleaner-Cut Strips...

with new fold-away Goodman Mill Strip Cutter

Don't be satisfied with hit-or-miss dimensions, rough or beveled edges, on your stock stripping. The Goodman Rubber Mill Strip Cutter is specially designed for precision requirements of stock feeding to another mill, extruder or lay up machine. A built-in micrometer knob assures exact control over stock width. The toolsteel blades produce a clean, square-edged strip, and are easily sharpened. And, for *maximum safety*, the whole unit swings up, holding blades against the mill frame completely out of the operator's way. Models are available for mounting on right or left frames, for all 42"-48"-54" or 60" two roll mills. Write today for illustrated bulletin.



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401 Richmond Street, Philadelphia 25, Pa.

Sales Representative:
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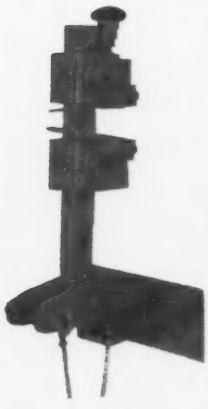
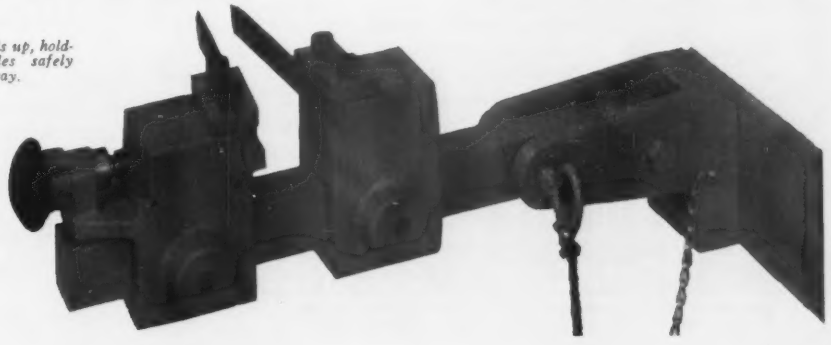


Unit folds up, holding blades safely out of way.



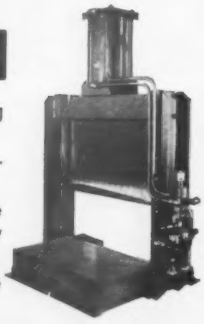
SPADONE
BALE CUTTERS
★ Automatic ★ Bench Type
★ Standard
A Model For Every Requirement

Cut Bales of Crude, Synthetic, Reclaimed Rubber . . . Plastics and Resins.

NEW
FULLY AUTOMATIC 29"

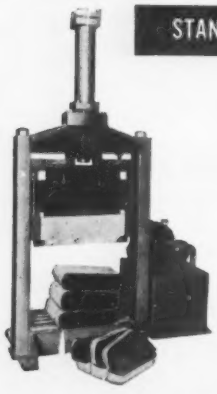
Automatically feeds, measures and cuts bales. Discharges cut pieces to take-away conveyor or tote box. Slice thickness adjustable from 2" to 6". Knife cuts on continuous time cycle or can be manually operated if desired. A fully self-contained unit. Knife 29" — stroke 23".

SMALL BENCH TYPE 24"



For laboratory use or compounding at Banbury.
Cuts full size synthetic Bales or Pre-cut Crude Rubber.
Air operated cushion action knife actuated by dual electric safety controls.
Easily mounted on Bench or Table — Knife 24" — stroke 12".

STANDARD 29" & NEW 50" MODELS

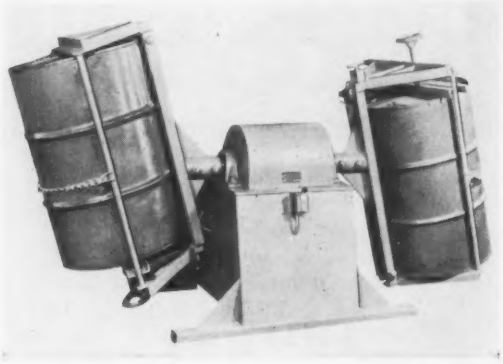


Cuts without lubricant.
Bales are advanced on rollers and can be cut into 1" minimum slices.
Cutters are manually operated and safety control valve requires operator to stand clear while knife is in motion.
Knife 29" — stroke 23" or knife 50" — stroke 36".
Write for details today — Your inquiries will have our prompt attention.

SPADONE MACHINE CO. INC.
SOUTH NORWALK, CONNECTICUT Phone: VOlunteer 6-3394
Chicago Office: 140 South Clark St. Phone: CEntral 6-6526

Dual Drum Tumbler

► The Tumble-Master Deluxe, a large scale, heavy steel dual drum tumbler, has been developed for dry coloring by Ball & Jewell, Inc., 24 Franklin St., Brooklyn 22, N. Y. At maximum capacity the tumbler can handle two 300-pound drums, 24 inches in diameter and 37 inches in height,



simultaneously. An operator slides drums onto the bracket during floor-level loading, then locks them into position for tumbling with a positive lock. Loading and unloading are further simplified by a reverse and jogging switch that positions the drums at any chosen point. The unit also features an oversize shaft, ball bearings, ratio motor drive and an extra heavy reinforced steel base.

Polyester Film Laminator

► Gordon Chapman Co., Detroit, Mich., is offering a machine designed specifically for straight or stretch-lamination of Goodyear Videne polyester film to foil, paper, fabric or other roll stock. The machine is capable of .0015 to .0075-inch straight and .0002-inch stretch-lamination. Of a Unistrut construction, the laminator is said to be readily adaptable to changes in gauge requirements, utilizing modern gear control to insure uniformity in lamination. The company plans to emboss to customer specifications to the stage of rolled and slitted finished goods.

Single Reel Take-Up

► A versatile take-up for wire insulating lines can accommodate reels up to 36 inches in diameter and 24 inches wide at speeds over 2000 feet per minute. Introduced by Davis-Standard, Div. of Franklin Research Corp., Mystic, Conn., the single reel machine has pneumatic reel arms and ball bearing mounted wire guide rolls that accept wires from gauge 0 to ¾ inch. This Model SR 36 also features an adjustable dog pin and infinitely adjustable traverse lay and movement.

RC

for low temperature Elastomers

PLASTICIZERS

* **RC Plasticizer TG-8**
  (Triethylene Glycol Dicaprylate)
* **RC Plasticizer TG-85**
  (Triethylene Glycol Caprate-Caprylate)
* **RC Plasticizer TG-9**
  (Triethylene Glycol Dipelargonate)
* **RC Plasticizer DOA**
  (Dioctyl Adipate)
* **RC Plasticizer DOS**
  (Dioctyl Sebacate)
* **RC Plasticizer DBP**
  (Dibutyl Phthalate)
* **RC Butyl Oleate**

For use in GR-S, Neoprene, Buna N and natural rubber compounds to reduce nerve and produce superior flex and smooth extrusions. Write for samples!

Ready . . . Reliable . . . RC serving American Industry since 1930.

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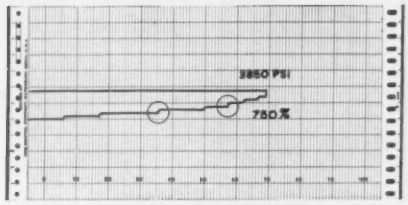
TEST TIPS
FROM THE SCOTT LABORATORY

Read Elastomeric Stress DIRECT IN PSI



Gauge compensation for direct-in-psi testing of elastomers is another indication of the *built-in* versatility and precision available with Scott's Model CRE electronic tester. The chart shows direct reading made possible through psi calibration and permits extraction, right from the test record, of data in the form desired. The critical qualities of *your* rubber or plastic products can also be evaluated simply, precisely, *and economically* with the Scott Model CRE tester.

Write for CRE BROCHURE

SCOTT TESTERS, INC.
85 Blackstone Street, Providence, Rhode Island

SCOTT TESTERS
THE SURE TEST . . . SCOTT!

rubber molds as-cast in ductile iron

BEAN

Many superior rubber products are now made in molds cast in ductile iron by Morris Bean & Co. Textured surfaces and complex shapes are faithfully duplicated. Often these molds save time and money.

Ductile iron is an ideal material for molds in many applications – particularly where service is rough and molds are subject to surface damage.

If you would like to investigate the possibilities of cast ductile iron molds, get in touch with Morris Bean & Co., Cedarville, Ohio.

MODEL AG5 ACCU-FLOW AIR GAUGE

A general-purpose non-contact gauge for use as measurer or comparator on a variety of critical applications.

A new standard of accuracy...

ACCU-FLOW* by AMES

B. C. Ames has perfected a new concept of air gauging that offers extremely fine measurement and unusual stability.

AMES ACCU-FLOW air gauges give you an accurate non-contact measuring method that is ideally suited to checking size variations on continuous production items such as wire, rubber, plastics, etc. Send for free ACCU-FLOW folder.

*Trademark of B. C. Ames Co.

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B.C. AMES CO.

38 Ames Street, Waltham 54, Mass.

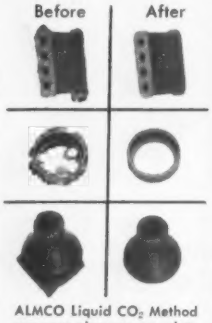
Canadian Representative—H. C. Burton Co. Ltd., Hamilton

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES

ELIMINATE HAND TRIMMING WITH ALMCO'S NEW

LIQUID CO_2 TUMBLER

Before | After



ALMCO Liquid CO_2 Method can now give you complete uniformity in a better quality finish on molded rubber parts of any size or shape. Saves time... saves money!

BOOST YOUR PRODUCTION

of Molded Rubber Parts

Eliminate hand trimming of flash and rind from your molded rubber parts by freezing them with liquid Co_2... *both before and during the fast tumbling cycle!*

Saves money. New ALMCO Liquid CO_2 Tumblers let you enjoy tremendous cost savings *of up to 75%* thru greatly increased production. Cost will approximate only $.015 to $.04 per lb. of rubber, depending on type of part finished.

Fully automatic. Liquid CO_2 is automatically injected thru the barrel shaft. Thermostatic controls keep temperatures constant down to —100°F. Process timer controls the tumbling cycle. Eight models, from 3.7 to 30.7 cu. ft.

For full story on Liquid CO_2 Tumbling and on processing sample parts, write for ALMCO Album of New Products... *today!*

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ALMCO

QUEEN PRODUCTS DIVISION

King-Seeley Corporation

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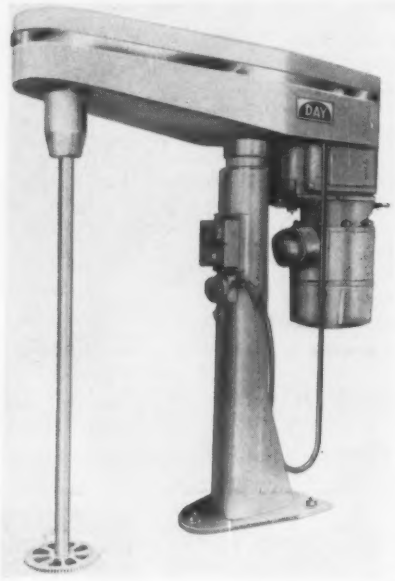

continuous operation by swinging in a 240-degree arc along which several batches are positioned for mixing. A hoist, operated by 80 pounds of air pressure, is cushioned at both ends of the stroke by an oil hydraulic circuit to allow rapid raising and lowering of the shaft and impeller. Laboratory size to large, 75-horsepower models of the mixer are manufactured by J. H. Day Co., a division of Cleveland Automatic Machine Co., Cincinnati, Ohio.

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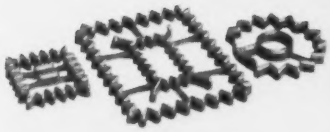

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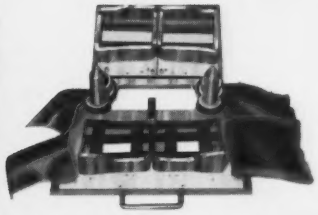

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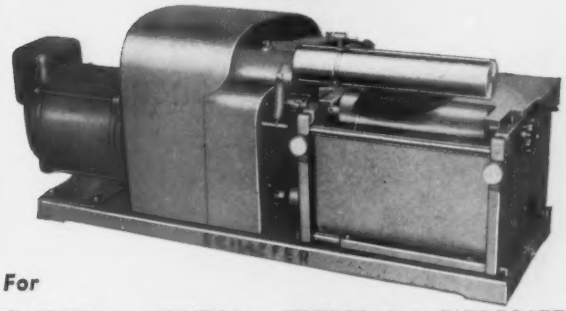

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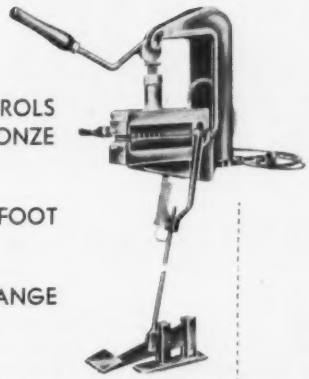

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Further details are easily obtained by writing to:

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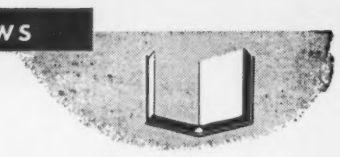
Reviews



Annual Report on the Progress of Rubber Technology: Vol. XXII—1958. Edited by T. J. Drakeley. Published by the Institution of the Rubber Industry, 4 Kensington Palace Gardens, London W.8, England. 9½ x 7 in. 125 pp. £1, 5s.

English customs and traditions are not noted for their tendency to radical change. The twenty-second report on British rubber technology covering developments during the past year does not depart essentially from the pattern set by its predecessors. However, a careful perusal of the chapters contributed by two dozen specialists in the major areas of rubber research and manufacture reveals some new shifts of focus.

For example, this is the first report to offer a section on the manufacture of synthetic rubber, a reflection of Great Britain's progress toward self-sufficiency in the field. During 1958, the International Synthetic Rubber factory at Hyde, near Fawley, became one of the first three large-scale, general purpose, synthetic rubber plants to begin production in Europe. It was expected to save many of the $25 million that England has been spending for SBR imports from the U. S., Canada and Germany. With nitrile rubber plants going on stream at Wilton and in South Wales and the DuPont neoprene plant under construction in Northern Ireland, butyl remained the only major elastomer not manufactured locally.

Two other trends mirrored in the report are England's growing interest in the Common Market together with a consolidation of its position in Commonwealth trade. There are frequent references to progress being made on the Continent, especially in Italy, Germany and France. At the same time, comfort is derived from the political stability shown by Malaya during its first full year of independence compared with the unrest that plagued Indonesia. One indirect result of this situation noted by the report is the prospect that Indonesia will soon lose its place to Malaya as the largest single source of natural rubber.

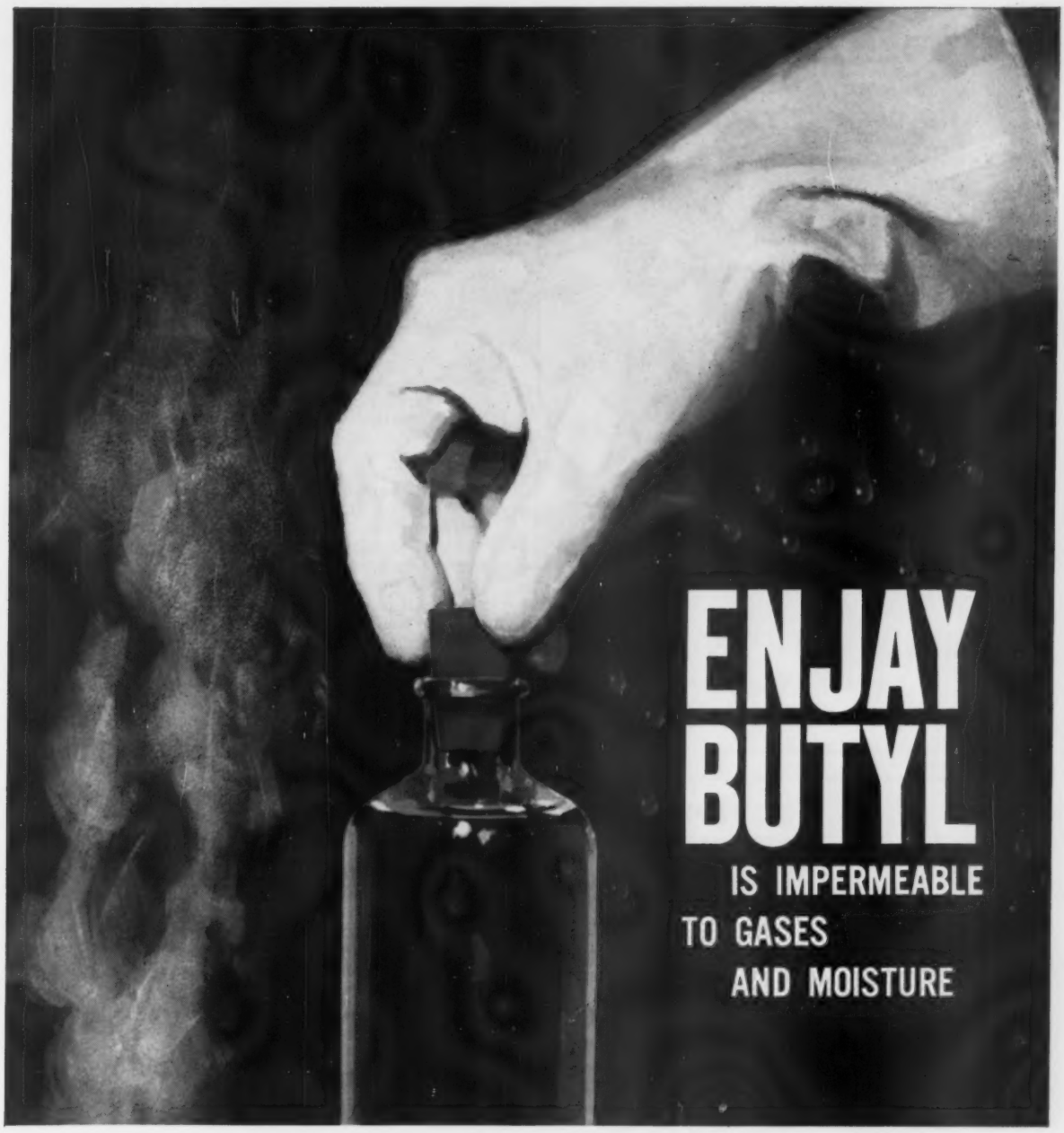
The chapter on tires registers dismay at the loss in mileage due to higher car speeds of recent U. S. models. The scheduled opening of motorways, the English equivalent of turnpikes, suggests to the author that increasing attention be given by Britain as well to the development of rubber compounds and cord materials providing greater high-speed heat resistance. Altogether, this report is an outstanding example of succinct, well-written reporting comprehensively documented by citations and statistics.

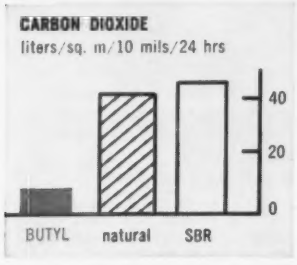
•

Tire Dynamics. By Andrew J. White. Published by Motor Vehicle Research, Inc., South Lee, N.H. 8 x 11 in. 268 pp. $15.00.

This reference work, primarily intended for lawyers and automobile accident investigators, reports on field studies of the relationship between tread stock materials of tires and stopping distance of passenger car vehicles under locked-wheel conditions. It is the result of five years' research costing a quarter of a million dollars and testing virtually all available makes of tires and automobiles.

It covers a variety of subjects, such as speedometers, effects of weight shift of automobiles on stopping distances, effects of speed on stopping distances, stopping distances of tires on various road surfaces such as concrete and asphalt, and tubeless tires. In the process, the study arrives at some surprising conclusions. It explains, for example, why tire mark measurements





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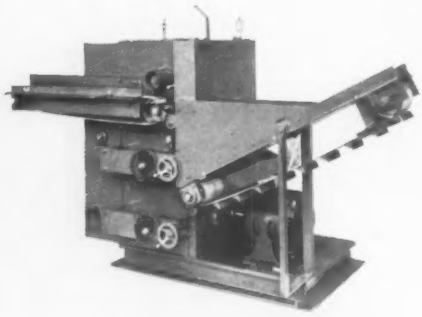

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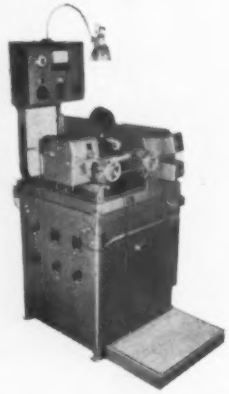

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cannot be related to vehicle speeds; shows that some retread tires can stop a vehicle faster than new premium tires, and indicates that smooth tires can stop a car faster than new ones on a dry roadway.

Nearly 400 photographs, tables, drawings and charts illustrate the text, permitting a graphic understanding of all phases in the test procedures. Extremely accurate measurements were obtained by a method in which a colored chalk charge was fired from a pistol at the roadway by a mechanism triggered the moment the brake pedal was depressed. Despite its legal emphasis, this book's scientific and technical data on tires makes it rewarding reading for anyone in the industry.

•

Continuous Analysis of Chemical Process Systems. By Sidney Siggia. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. 6 x 9 in. 381 pp. $8.50.

Details on all phases of the new analytical devices designed to attain economical, accurate and continuous monitoring of chemical process systems are presented by this volume. These are shown to differ from conventional lab devices in that the on-stream analytical instruments function automatically and directly in the processing equipment or pipeline. Furthermore, recorder charts and dial readings permit a constant check of the chemical composition in process systems.

The authoritative and up-to-date information in this book was collected from journals, commercial literature and personal communications, then reviewed and approved by the instrument companies manufacturing continuous analytical devices. Each instrument is described according to principle of operation, range of application, accuracy and precision, installation and construction specifications, time for response, use with controllers, versatility and interferences. Examples of the use of each instrument in specific applications are also given.

The text is tailor-made for practicing analysts and engineers who have to establish plant control systems. It offers them in one place all the information necessary to screen the various instruments available for such applications as the monitoring of polymerization reactions. In addition, for the student of analysis, it deals with a portion of instrument analysis not covered in the usual textbooks or in the standard courses.

BOOKLETS, CATALOGS, etc.

Immersion Heaters. N. J. Thermex Co., Inc., 533-535 Bergen St., Harrison, N. J. 8½ x 11 in. 6 pp.

The immersion heaters described in this brochure are newly designed for corrosion resistance and the reduction of internal heat build-ups. A variety of models for specific liquid heating problems is presented, with sheaths made of quartz, steel or stainless steel. A chart supplies a curve for computing heating requirements of liquids. Illustrations and technical data are given.

•

Special Tensile Tester Grips. (Bulletin 101-TT). Thwing-Albert Instrument Co., Penn St. and Pulaski Ave., Philadelphia 44, Pa. 8½ x 11 in. 4 pp.

Five different sets of tensile tester grips are described and illustrated in this bulletin. The particular application of each set of grips is outlined and relevant specifications are listed. The grips are suggested for use with any tensile tester for testing paper, plastics, cloth, leather and other materials.

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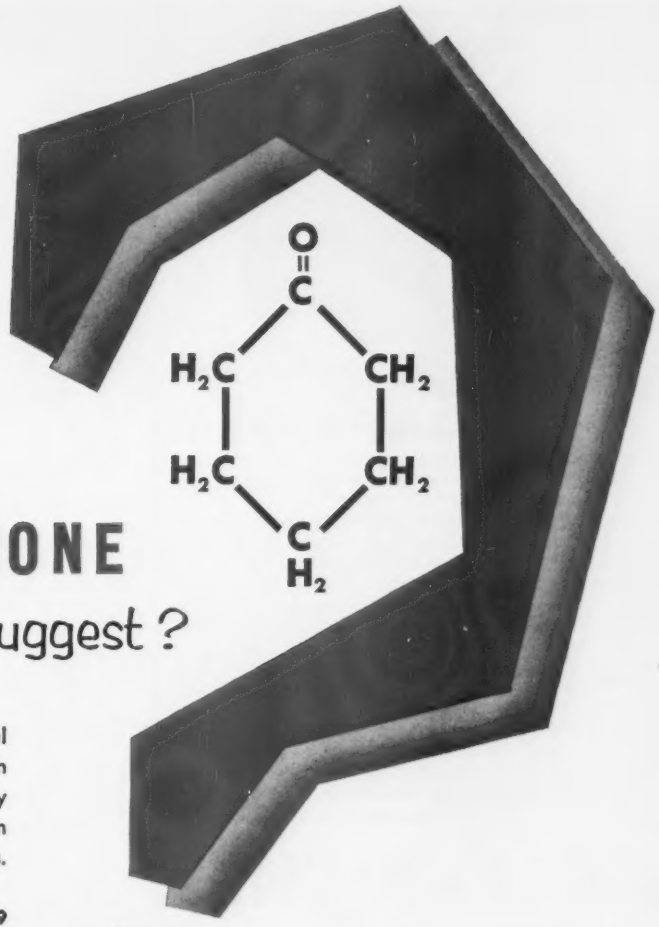

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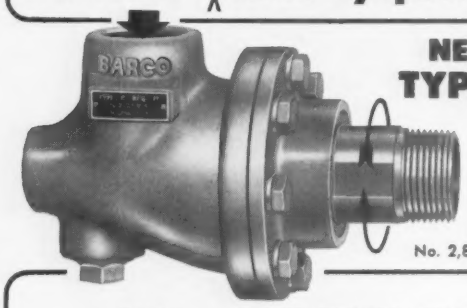

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REVIEWS (CONT'D)

G-E Silicone Antifoams. (Bulletin CDS-204). Silicone Products Dept., General Electric Co., Waterford, N. Y. 8½ x 11 in. 8 pp.

This bulletin points out the advantages of low viscosity silicone emulsions over other chemical and mechanical defoamers in terms of economy and effectiveness. After analyzing the causes and costliness of foaming in industrial processes, the pamphlet explains how to choose the proper defoamer for both aqueous and non-aqueous systems. Recommendations are given on the equipment and methods to use in obtaining maximum performance from chemical defoamers. Of particular interest to laboratory personnel are techniques for easily evaluating the effectiveness of defoamers for a specific system.

•

Packaged Control Systems. (Bulletin No. 159). Protection Controls, Inc., 6000 N. Legett Ave., Chicago 46, Ill. 8½ x 11 in. 4 pp.

Packaged, centralized control units that can supply automation for batching, combustion and other production stages are described in this bulletin. Illustrations show various custom-engineered control panels which combine a wide range of sequencing, supervising, indicating and power controls for industrial processes, machine automation and heating applications. Among the benefits cited for centralized controls are that custom-engineering can meet specific operating or safety requirements, and that compact single-unit controls are easier to service.

•

Case History Bulletin. (No. 509-2). Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass. 8½ x 11 in. 6 pp.

This case history bulletin describes the use of pallets and electric fork lift trucks for the better utilization of warehouse space and a decrease in the working force. The two-color presentation has nine photographs showing the step-by-step procedure followed for storage and shipping by a liquor distributor in Georgia. The account of palletized handling of kegs and multi-sized cartons enumerates specifications of pallet sizes, stacking heights and required equipment.

•

Heavy Liquids. Engineered Materials, P. O. Box 363, New York 8, N. Y. 8½ x 11 in. 12 pp.

This booklet discusses the heavy liquids method for sink-float density determinations in quality control and research. The technique employs organic liquids for densities ranging to 3.3, aqueous liquids to 4.0 (with melts extending the range to 5.0), mercury suspensions to 7.5, and low melting point alloys produced to order for higher densities. These heavy liquids are used for the identification of many substances, including plastics, and are especially suited to quality control of ceramics and glass.

•

Hydraulic Dipping Machines. Lionel Hook & Sons, Ebley, Stroud, Glos., England. 7 x 9 in. 14 pp.

This new edition of an English firm's catalog illustrates and describes seven models of dipping machines, as well as rotatable frames and circulating tanks. New design features and technical specifications of the equipment are supplied. The text notes that, while most of the descriptive matter applies to latex dipped goods, the machines are also capable of handling polyvinyl chlorides as the raw material. Special export instructions are added.

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (November 2), the price of natural rubber on the New York Commodity Exchange has moved in the wide range of 700 points, high for the period being 49.00c reached on November 16, and low being 42.00c reached on November 30. The average price of spot rubber for the month of November was 45.16c based on 19 trading days. This compares with an average of 41.50c in the previous month.

Rubber Prices Drop

Rubber prices during the month sagged mainly for two reasons. A recent selling announcement by the General Services Administration on rotation rubber brought one wave of price declines. Later in the month, rubber prices both here and abroad dropped on reports that the Soviet Union and Red China were through with their rubber purchases for the remainder of the year.

Analysts at Merrill Lynch, Pierce, Fenner & Smith, point out that prior to the GSA announcement, world demand was high with prices nearing 50c. Consumption was in high gear abroad and there were indications that it would go higher in the United States. Added to this was the fact that natural stocks are somewhat below normal.

Conditions now are somewhat different. True, stocks of natural are still below normal. However, the steel strike has had its effect upon the automobile industry. This, in turn, has had its effect on rubber consumption. Prior to the steel strike, some people were talking in terms of an 8 million passenger car production in 1960.

The possibility exists that the steel strike will continue after the present "cooling-off" period. There is also the possibility of a rail strike in February. These factors tend to have their influences upon the market picture.

Soviet Unpredictability

Added to this is the general unpredictability of Soviet bloc purchases mentioned previously. In the first ten months of 1959, Russia and Red China took 177,000 tons of natural rubber, MLPFS reports. This is about 75,000 tons more than in the comparable period of 1958. No one can predict with any degree of certainty what Soviet bloc purchases will be in the months ahead.

Trade spokesmen have noted that high prices for natural rubber are removing natural from competition with synthetic. The thought has been expressed that natural may be pricing itself out of the market, even at a 42c level. Perhaps the next few months will give some clearer indication of trends.

NEW YORK, DECEMBER 1, 1959

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM NOV. 1 TO NOV. 30

Nov.	Spot	Jan.	Mar.	May	Sales
1	....	....	....	....	...
2	45.00	39.45	37.10	36.35	25
3	....	....	....	....	...
4	45.00	39.35	37.10	36.45	73
5	43.50	39.00	36.95	36.00	88
6	42.50	38.45	36.75	35.80	66
7	....	....	....	....	...
8	....	....	....	....	...
9	43.00	39.25	37.35	36.51	56
10	44.25	40.40	38.30	37.40	106
11	47.00	42.25	40.30	38.75	210
12	48.50	44.25	41.50	39.85	166
13	48.00	42.95	40.00	38.95	200
14	....	....	....	....	...
15	....	....	....	....	...
16	49.00	44.95	42.10	41.10	140
17	46.00	43.52	40.80	39.68	153
18	47.50	44.30	41.40	40.20	60
19	47.00	43.10	40.00	38.90	169
20	46.00	43.10	39.80	38.70	82
21	....	....	....	....	...
22	....	....	....	....	...
23	43.50	41.60	38.70	38.00	136
24	44.00	42.72	39.75	38.75	70
25	43.25	41.80	39.10	38.00	40
26	....	....	....	....	...
27	43.00	41.59	39.35	38.25	63
28	....	....	....	....	...
29	....	....	....	....	...
30	42.00	40.55	38.60	37.65	91

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.42
Jan.	.40¾
Feb.	.40
Thin Latex Crepe:	
Spot	.47½
Thin Brown Crepe, No. 2	.40
Flat Bark Crepe	.37¼

London Market
(Standard Smoked Sheets)

Jan.-Mar.	38.08 — 38.23
Apr.-June	35.89 — 36.18

Singapore Market
(Standard Smoked Sheets)

Jan.	38.21 — 38.29

Middling Upland Quotation

	Oct. 30	November 30		
	Close	High	Low	Close
Dec.	32.41	32.71	32.66	32.66
Mar.	32.88	33.14	33.10	33.11
May	33.11	33.29	33.27	33.27

Notes & Quotes

In an address before the 44th Annual Meeting of the Rubber Manufacturers Association held recently in New York City, Earl B. Hathaway, vice-president in charge of sales for the Firestone Tire & Rubber Co., stated that the coming decade is holding out the possibility of great sales and great profits in the rubber industry. 1960, he declared, will be the greatest year the rubber industry has ever had and this will hold true for many of the individual segments of the industry.

Synthetic Rubber

According to the Rubber Manufacturers Association, consumption of all types of synthetic rubber in October increased to 97,480 long tons, compared with September's consumption of 96,859 long tons. Synthetic rubber accounted for 66.65 per cent of total new rubber consumption, a new high level. The September ratio was 66.29 per cent. For the first ten months of 1959, the ratio was 65.64 per cent against 64.41 per cent for the same period of 1958.

In his address before the 44th Annual Meeting of the Rubber Manunfacturers Association held recently in New York City (reported in full elsewhere in this issue), George R. Vila, group executive vice-president of the U. S. Rubber Co., stated that world production of synthetic rubber will more than double in the next ten years.

World Synthetic Production

According to Mr. Vila's estimates, world production of synthetic rubber will be more than 4 million tons by 1970. In 1970, he declared, the United States will be consuming three pounds of synthetic rubber for every pound of natural. The rest of the world will be consuming three pounds of synthetic for every *two* pounds of natural rubber.

In analyzing the markets for the various types of synthetic rubber, Mr. Vila observed that continuing increases are expected for oil-extended styrene rubber due to its economy and generally high level of performance. Black masterbatches are also on the upswing.

Butyl rubber, he said, is slowly recovering from its loss of the inner tube market and is now expanding on a solid basis. Halogenated types are coming onto the market, and interesting properties for these materials have been reported.

The nitrile types of synthetic rubber are also moving ahead, mainly in the oil-resistant fields. Recently introduced types have weathering characteristics equal to neoprene, and in interesting competition is taking place for this segment of the specialty rubber market.

Stereo-Regular Rubbers

The "stereo-regular" polymers can be expected to make significant gains in the years ahead. Some of these new rubbers are replacing natural rubber in such applications as heavy duty tires; other types will make inroads into styrene rubber outlets. Urethane is also making significant advances, particularly in the foam field, Mr. Vila noted.

In all, the future for synthetic rubber seems very promising and synthetic producers have reason to look to the years ahead with every confidence.

on the line...

FIVE NEW ACCELERATORS . . . *Cyanamid is now able to serve your entire accelerator needs . . . from latex and butyl recipes through SBR and natural, Cyanamid accelerators give consistent results that keep compounders happy. Send for samples and information.*

CYURAM*MS	*Pellets Powder*	Tetramethylthiuram Monosulfide
CYURAM*DS	*Pellets Powder*	Tetramethylthiuram Disulfide
CYZATE*B	*50% aqueous dispersion*	Zinc Dibutyl Dithiocarbamate
CYZATE*E	*50% aqueous dispersion*	Zinc Diethyl Dithiocarbamate
ZMBT	*Powder*	Zinc Salt of Mercaptobenzothiazole

*Trademark

CYANAMID **AMERICAN CYANAMID COMPANY** Rubber Chemicals Department Bound Brook, New Jersey

PRICES OF COMMERCIALLY AVAILABLE

Dry Rubber

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene NF	.4900
Butaprene NH	.6500
Butaprene NL	.5000
Butaprene NXM	.5800
Chemigum N1NS	.6400
Chemigum N3NS and N5	.5800
Chemigum N6	.5000
Chemigum N6B	.5000
Chemigum N7	.5000
Chemigum N8	.5000
Chemigum N600	.5000
Herecol N-33	.6800
Hycar 1001 and 1041	.5800
Hycar 1002	.5000
Hycar 1014	.6000
Hycar 1042 and 1043	.5000
Hycar 1051	.5800
Hycar 1052	.5000
Hycar 1053	.5000
Hycar 1072	.6400
Hycar 1203	.4600
Hycar 1312	.5000
Hycar 1411	.6200
Hycar 1432	.5900
Hycar 1441	.6200
Paracril AJ	.4850
Paracril B and BJ	.5000
Paracril BLT and BJLT	.5000
Paracril C and CLT	.5800
Paracril CV	.5900
Paracril D	.6500
Paracril 18-80	.6000
Paracril OZO	.4600
Polysar Krynac 800	.5000
Polysar Krynac 801	.5800
Polysar Krynac 802	.5000
Polysar Krynac 803	.5000

Butadiene-Styrene Types

Ameripol 1000	.2410
Ameripol 1001	.2410
Ameripol 1002	.2435
Ameripol 1006	.2410
Ameripol 1006 (crumb)	.2475
Ameripol 1007	.2410
Ameripol 1009	.2475
Ameripol 1009 (crumb)	.2590
Ameripol 1011	.2475
Ameripol 1012	.2425
Ameripol 1012 (crumb)	.2490
Ameripol 1013	.2410
Ameripol 1013 (crumb)	.2615
Ameripol 1500 and 1501	.2410
Ameripol 1502	.2410
Ameripol 1703	.2060
Ameripol 1705	.2035
Ameripol 1707	.1910
Ameripol 1708	.1910
Ameripol 1710	.1885
Ameripol 1712	.1885
Ameripol 1805	.1550
Ameripol 4600	.2410
Ameripol 4650	.1820
Ameripol 4651	.1770
Ameripol 4652	.1425
Ameripol 4654	.1870
Ameripol 4655	.1820
Ameripol 4700	.1750
Ameripol 4750	.1545
Ameripol 4751	.1400
Ameripol 4752	.1600
Ameripol 4753	.1480
ASRC 1000	.2410
ASRC 1001 and 1004	.2410
ASRC 1006	.2410
ASRC 1009	.2475
ASRC 1018	.2700
ASRC 1019	.2650
ASRC 1500	.2410
ASRC 1502	.2410
ASRC 1503	.2625
ASRC 1703	.2060
ASRC 1708	.1910
ASRC 1712	.1885
ASRC 1713	.1750
TSRC 3105 and 3106	.2410
ASRC 3110	.2600
Baytown 1600	.1930
Baytown 1601	.1930
Baytown 1602	.1930
Baytown 1801	.1760
Baytown 1803	.1740
C-102 (Shell)	.2300
Carbomix 3750	.1820
Carbomix 3751	.1545
Carbomix 3752	.1845
Carbomix 3753	.1640
Carbomix 3756	.1569
Carbomix 3757	.1480
Carbomix 3758	.1545
Carbomix 3760	.1496
CB-102 (Shell)	.1850
Copo 1500	.2410
Copo 1502	.2410
Copo 1505-NS	.2610
Copo 1712	.1885
Copo 1773	.2060
Copo 1778	.1910
Copo 3700	.1725
Copo 3701	.1750
Copo 3900	.2310
FR-S 146	.2410
FR-S 158	.3000
FR-S 173	.2060
FR-S 178	.1910
FR-S 181	.2410
FR-S 182	.2410
FR-S 184	.1885
FR-S 1000	.2410
FR-S 1001	.1410
FR-S 1004	.2410
FR-S 1006	.2410
FR-S 1007	.2410
FR-S 1009	.2475
FR-S 1010	.2600
FR-S 1012	.2425
FR-S 1013	.2410
FR-S 1014	.2810
FR-S 1500	.2410
FR-S 1502	.2410
FR-S 1703	.2060
FR-S 1710	.1885
FR-S 1712	.1885
Gentro 1500	.2410
Gentro 1712	.1885
Gentro-Jet 9152	.2080
Gentro-Jet 9153	.1820
Gentro-Jet 9154	.1845
Gentro-Jet 9250	.1580
Gentro-Jet 9251	.1640
Gentro-Jet 9252	.1670
Gentro-Jet 9275	.1500
Naugapol 1016	.2650
Naugapol 1018	.2700
Naugapol 1019	.2650
Naugapol 1022	.2950
Naugapol 1023	.3150
Naugapol 1503	.2625
Naugapol 1504	.0330
Naugapol 6003	.2700
Naugapol 6100	.3100
OB-102 (Shell)	.1825
OB-104 (Shell)	.1475
OB-106 (Shell)	.1510
OB-110 (Shell)	.1410
OB-111 (Shell)	.1540
OB-113C (Shell)	.1750
OB-114C (Shell)	.1420
Philprene 1000	.2410
Philprene 1001	.2410
Philprene 1006	.2410
Philprene 1009	.2475
Philprene 1018	.2700
Philprene 1019	.2650
Philprene 1500	.2410
Philprene 1502	.2410
Philprene 1503	.2625
Philprene 1601	.1930
Philprene 1603	.1940
Philprene 1605	.1900
Philprene 1703	.2060
Philprene 1708	.1910
Philprene 1712	.1885
Philprene 1803	.1740
Philprene 1805	.1550
Plioflex 1006	.2410
Plioflex 1500C	.2410
Plioflex 1502	.2410
Plioflex 1507	.2410
Plioflex 1703	.2060
Plioflex 1710C	.1885
Plioflex 1712C	.1885
Plioflex 1713	.1750
Plioflex 1714C	.1725
Plioflex 1773	.2060
Plioflex 1778	.1910
Polysar Kryflex 200	.2510
Polysar Krylene	.2410
Polysar Krylene NS	.2410
Polysar Krynol 651	.1885
Polysar Krynol 652	.1910
Polysar S	.2410
Polysar S-50	.2410
Polysar S-X 371	.2550
Polysar SS-250	.2875
S-1000	.2300
S-1002	.2325
S-1006	.2300
S-1009	.2400
S-1011	.2325
S-1013	.2300
S-1500	.2300
S-1502	.2300
S-1509	.2300
S-1600	.1825
S-1602	.1825
S-1605	.1800
S-1703	.1950
S-1707	.1800
S-1709	.1775
S-1710	.1775
S-1712	.1775
S-1803	.1650
S-1804	.1750
S-7701	.1850
SP-103 (Shell)	.2900
Synpol 1000	.2410
Synpol 1001	.2410
Synpol 1002	.2435
Synpol 1006	.2410
Synpol 1007	.2410
Synpol 1009	.2475
Synpol 1012	.2425
Synpol 1061	.2410
Synpol 1500	.2410
Synpol 1502	.2410
Synpol 1551	.2410
Synpol 1703	.2060
Synpol 1707	.1910
Synpol 1708	.1910
Synpol 1711	.1900
Synpol 1712	.1885
Synpol 8000	.2410
Synpol 8150	.1930
Synpol 8200	.1910
Synpol 8201	.1750
Synpol 8250	.1740
Synpol 8253	.1584
Synpol 8254	.1545
Synpol X-274	.2550

Butyl Rubbers

Enjay Butyl 035 and 150	.2300
Enjay Butyl 165 NS	.2400
Enjay Butyl 215	.2300
Enjay Butyl 217	.2300
Enjay Butyl 218	.2300
Enjay Butyl 268 NS	.2400
Enjay Butyl 325	.2300
Enjay Butyl 365 NS	.2400
Polysar Butyl 100	.2450
Polysar Butyl 101	.2775
Polysar Butyl 200 and 300	.2450
Polysar Butyl 301	.2550
Polysar Butyl 400	.2450

Chlorosulfonated Polyethylene

Hypalon 20	.7000
Hypalon 30	.7000

Fluoroelastomers

Kel-F Fluorel	$15.00
Kel-F 3700	$16.00
Kel-F 5500	$16.00
Viton A	$10.00
Viton A-HV	$10.00
Viton B	$13.00

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500
Neoprene Type AD	.5500
Neoprene Type FB	.6500
Neoprene Type GN	.4100
Neoprene Type GN-A	.4100
Neoprene Type GRT	.4200
Neoprene Type KNR	.7500
Neoprene Type S	.4200
Neoprene Type W	.3900
Neoprene Type WB	.4100
Neoprene Type WHV	.3900
Neoprene Type WRT	.4500
Neoprene Type WX	.4100

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.5000
Thiokol Type FA	.6900
Thiokol Type ST	1.2500

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.50
GE Silicone Gum (not compounded)	4.00
Silastic (compounded)	2.50
Silastic (gums)	4.00
Union Carbide (gums)	4.00
Union Carbide (compounds)	2.50

SYNTHETIC RUBBER POLYMERS

Latex

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600	1
Butaprene N-400 and N-401	.5400	1
Chemigum 200	.4900	1
Chemigum 235 and 236	.5400	1
Chemigum 245	.4600	1
Chemigum 246	.4600	1
Chemigum 247	.4600	1
Chemigum 248	.4600	1
Hycar 1512	.4500	2
Hycar 1551	.5300	2
Hycar 1552	.4500	2
Hycar 1561	.5300	2
Hycar 1562	.4500	2
Hycar 1571	.5300	2
Hycar 1572	.4500	2
Hycar 1577	.4500	3
Tylac 640	.4500	1
Tylac 740	.4900	1
Tylac 840	.5300	1
Tylac 1640	.5400	1
Tylac 2241	.5300	1
Tylac 2430	.5000	1
Tylac 2570	.5300	1
Tylac 2830	.4500	1

Butadiene-Styrene Types

CL-101 (Shell)	.2800	1
Copo 2000	.2775	2
Copo 2101	.3000	2
Copo 2102	.3200	2
Copo 2105	.3200	2
Copo 2108	.3000	2
Copo 2109	.2775	2
Copo 2110	.3200	2
Copo 3852	.2900	2
FR-S 110	.3000	2
FR-S 150	.3000	2
FR-S 151	.2900	2
FR-S 174	.2950	2
FR-S 176	.2775	2
FR-S 2000	.2775	1
FR-S 2001	.2775	1
FR-S 2002	.3000	1
FR-S 2003	.3050	1
FR-S 2004	.3050	1
FR-S 2006	.2900	1
FR-S 2105	.3200	1
Naugatex 2000	.3375	1
Naugatex 2001	.3375	1
Naugatex 2002	.3500	1
Naugatex 2006	.3900	1
Naugatex 2105	.3600	1
Naugatex 2107	.3600	1
Naugatex 2108	.3600	1
Naugatex 2113	.3400	1
Nitrex 2612	.5000	1
Nitrex 2614	.4600	1
Nitrex 2614-A	.4600	1
Nitrex 2615	.5100	1
Nitrex 2615-A	.5100	1
Nitrex 2616	.5800	1
Nitrex 2617	.4600	1
Nitrex 2617-A	.4600	1
Nitrex 2619	.5700	1
Nitrex 2620	.5000	1
Nitrex 2625	.5000	1
Nitrex 2625-A	.5000	1
Nitrex J-6849	.5400	1
Pliolite 2000	.2775	1
Pliolite 2001	.2775	1
Pliolite 2076	.2900	1
Pliolite 2104	.3200	1
Pliolite 2105	.3200	1
Pliolite 2107	.3200	1
Pliolite 2108	.3000	1
S-2000 and S-2006	.2600	2
S-2101	.2600	2
S-2105	.2800	2
S-2108	.2900	2

Neoprene

Neoprene Latex 60	.4000	2
Neoprene Latex 571	.3700	2
Neoprene Latex 572	.3900	2
Neoprene Latex 601-A	.4000	2
Neoprene Latex 673	.5000	2
Neoprene Latex 735	.3800	2
Neoprene Latex 736	.3800	2
Neoprene Latex 842-A	.3700	2
Neoprene Latex 950	.4700	2

Polysulfide Rubbers

Thiokol Type MX	.8000	2
Thiokol Type WD-2	1.2500	2
Thiokol Type WD-6	.8000	2

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

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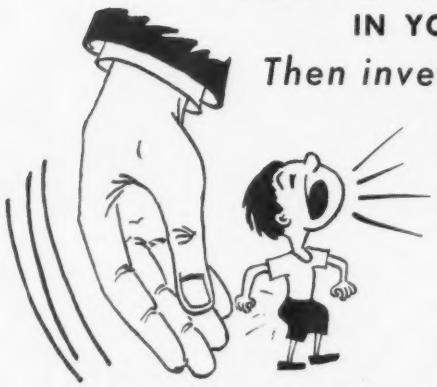

Neophax is

- compatible with Neoprene, synthetics, and crude rubber,
- aids in processing,
- improves extrusion, maintains die size,
- stabilizes mold dimensions,
- permits wide durometer range,
- yields ultimate plasticizing.

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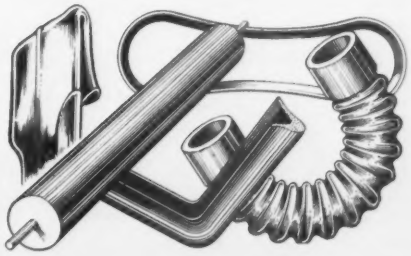


Feel free to submit your problems to us. Just explain your difficulty, or describe the effect you wish to achieve. Without obligation, our laboratory will gladly make helpful recommendations. Data on request any time.

Factice
THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO., STAMFORD, CONN.

MARKETS

(continued)

Reclaimed Rubber

The Rubber Manufacturers Association reports that a total of 257,243 long tons of reclaimed rubber were produced in the first ten months of the year compared with the 212,382 long tons produced in the first ten months of 1958. In the first ten months of 1959, 243,409 long tons of reclaimed rubber were consumed in the United States against the 203,376 long tons consumed in the first ten months of the previous year.

The year-end figures should indicate that something in excess of 300,000 long tons of reclaim will have been produced in the United States in 1959. Total consumption for the year should also be close to the 300,000 long ton level.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¾
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

In the first ten months of this year a total of 234,033 long tons of scrap rubber were consumed in the United States according to the Rubber Manufacturers Association. Consumption in recent months has been proceeding on a 25,000 long ton a month basis. It would seem, then, that total consumption for the year will be in the neighborhood of 280,000 long tons. As of October 31, 1959, there were 65,260 long tons of scrap on hand.

Little or no change has been noted in the scrap rubber market during recent weeks. There has been a fairly regular movement of material to consumers but the quantities involved have not been too large. Prices remain stable.

(Prices Delivered Akron)

Mixed tires	ton	15.00
Light colored carcass	lb.	.05
No. 1 peelings	ton	40.00
No. 2 peelings	ton	28.00
No. 3 peelings	ton	23.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	22.00
Passenger S.A.G.	ton	20.00
Natural Rubber Red Tubes	lb.	.07¼
Natural uRbber Black Tubes	lb.	.06½
Butyl Rubber Tubes	lb.	.06¼

Tire Fabrics

The Textile Economics Bureau reports that second quarter 1959 production of tire cord and fabric (excluding chafer fabric) totaled 105,000,000 pounds, a decline of 4½ per cent from the first quarter level, but 29,000,000 pounds above the second quarter 1958 total of 76,000,000 pounds.

In the latest quarter, the output of nylon cord and fabric decreased to 28,000,000 pounds from the first quarter level of 32,000,000 pounds, while rayon cord and fabric output decreased 1,000,000 pounds to 76,000,000 pounds.

Chafer fabric production in the second quarter of this year at 11,000,000 pounds compared with 13,000,000 pounds in the first quarter of 1959 and 9,000,000 pounds in the second quarter of the previous year. The latest total included 3,000,000 pounds of man-made fiber and 8,000,000 pounds of cotton chafer.

The Textile Economics Bureau reports that inventories of filament yarn held by tire manufacturers showed little change, but tire cord stock increased substantially.

New Acrylonitrile Plant

DuPont has announced that its Explosive Department will construct a plant to manufacture acrylonitrile at one of the firm's present plant sites in Beaumont, Texas. The entire output of the plant will be used for the production of Orlon acrylic fiber.

The Explosives Department will thus be producing raw materials for three DuPont non-cellulosic fibers in the future. A plant a Beaumont is now being constructed to produce caprolactam, an intermediate for Nylon 6 fiber and plastics. Another plant at Old Hickory, Texas, will produce dimethyl terephthalate which will be used in the production of the company's Dacron polyester fiber.

The new acrylonitrile unit will use a recently patented process involving synthesei from ammonia and propylene, two low-cost and abundant raw materials. Operation of this new unit is expected to begin in the spring of 1961.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.67½
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.82
840	lb.	1.47

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.72
9.25 oz. (per square yard)	lb.	.69
11.65 oz. (per square yard)	lb.	.63
14.4 oz. (per square yard)	lb.	.72

Liquid Latex

Natural: In the first ten months of the current year a total of 68,117 long tons of natural rubber latex were imported into the United States according to the Rubber Manufacturers Association. This compares with the 55,567 long tons imported in the first ten months of the previous year.

In the first ten months of 1959 a total of 61,498 long tons of natural latex were consumed in the United States against the 56,965 long tons consumed in the first ten months of 1958. As of October 31, 1959, there were 12,450 long tons of natural latex in stocks on hand, equal to about a two month's supply.

It still looks as though a total of 75,000 long tons of natural rubber latex will be consumed in the United States in 1959. During all this time, natural rubber latex will have been selling at above a 40c level. Currently, natural latex is selling at a 48-50c level at east coast ports in car load lots. The great demand for latex has tended to over-ride usual consumer resistance to above 40c latex in 1959. The question now is—will the same hold true for 1960?

Synthetic: In the first nine months of this year a total of 87,888 long tons of synthetic latex were produced in the United States and 78,166 long tons consumed. This compares with 59,238 long tons and 54,954 long tons, respectively, in the first nine months of the preceding year. Synthetic latex production in 1959 should easily top 100,000 long tons, while consumption should fall only slightly short of that total.

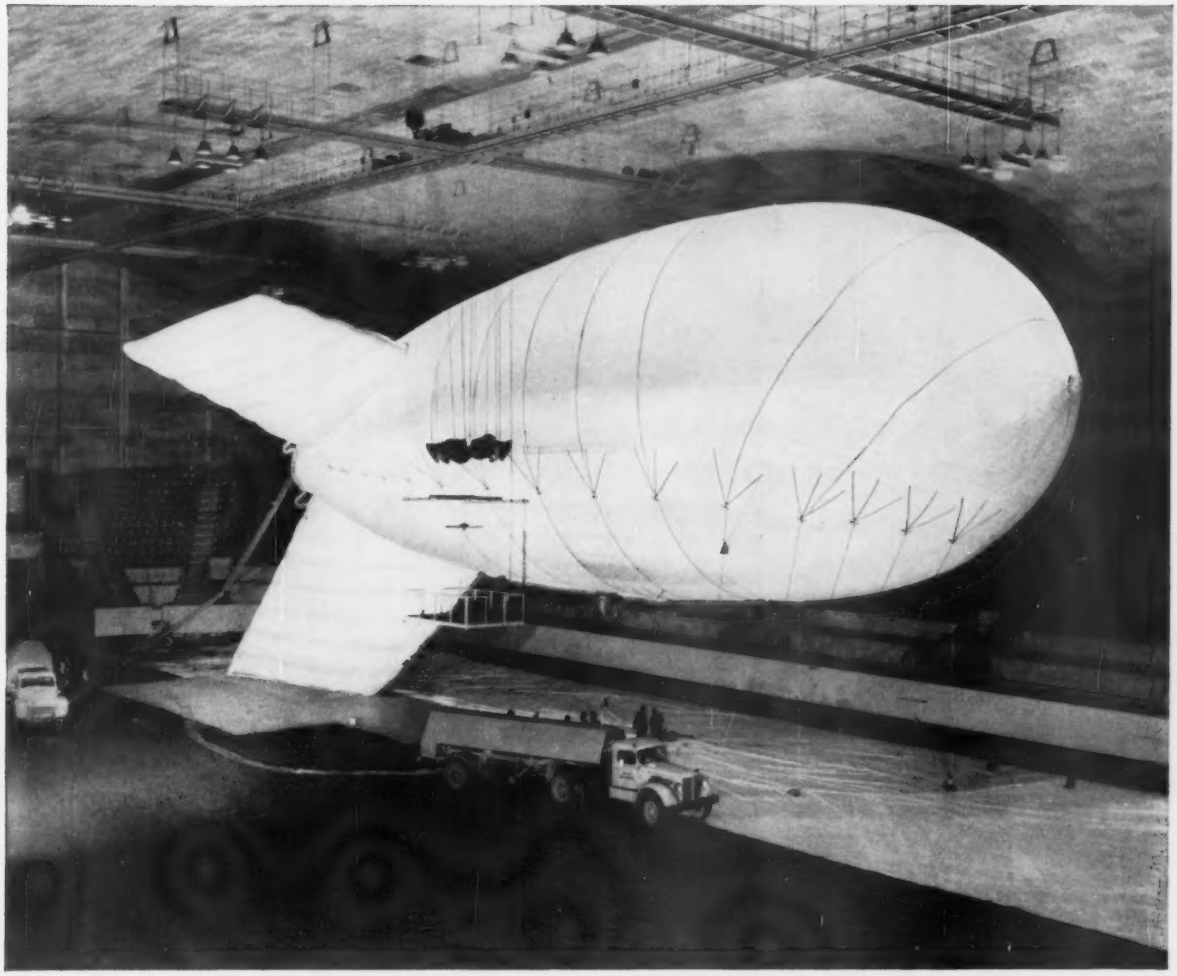
Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the very narrow range of 15 points since our last report (November 2), high for the period being 32.85c reached on November 13 and maintained for the rest of the month, and low being 32.70c reached on November 2 and on six other days during the period. The average price of middling uplands for the month of November was 32.79c based on 19 trading days. This compares with an average of 32.77c in the previous month.

The Department of Agriculture states that world cotton consumption in 1959-60 may total more than 46,000,000 bales, another record high. This would exceed last year's figure by about 2,000,000 bales and would be about 10 per cent above the 1954-58 average. Consumption increases are expected in most countries including the United States.

The increase abroad, it is believed, will be greatest in foreign free world importing countries, reversing the trend of the past two seasons. The textile recession abroad is disappearing, and improved economic conditions are strengthening the demand for cotton textiles while burdensome inventories of finished goods have been reduced.

Fabric takes to the air in giant Aerocap Balloon



Recently developed by the Mechanical Division of General Mills, a huge balloon made of impregnated fabric now provides a practical means for establishing captive aerial platforms for scientific equipment. Designed for stability and durability under adverse weather conditions, these amazing Aerocaps—the largest of which can lift up to 15,000 pounds—have been used in atomic weapons testing and in elevating radar antennas, acoustical measuring devices and other scientific instrumentation.

The fabric that meets the rugged requirements of this revolutionary development is Wellington Sears nylon, one of many base fabrics engineered for specific jobs of all kinds . . . for laminating, coating and rubberizing.

Wellington Sears has been supplying fabrics to industry for more than a century. Why not take advantage of this experience for help in your own fabric applications. Write today for your copy of a free illustrated booklet, "Fabrics Plus." Address Dept. G-12.

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MARKET PRICES

DECEMBER 1, 1959

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*Trademark. †For Export Only.

The arrangement of this section closely follows the Chemical Section of the 1959 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.74	.81
A-32*	lb.	.66	.80
A-100*	lb.	.52	.66
Accelerator No. 8*	lb.	—	1.25
Accelerator—49*	lb.	.59	.60
Accelerator 89*	lb.	—	1.20
Accelerator 108*	lb.	—	.92
Accelerator—552*	lb.	—	2.25
Accelerator—808*	lb.	.66	.68
Accelerator—833*	lb.	1.17	1.19
Accelerator B*	lb.	—	.89
Altax*	lb.	.54	.56
Amax*	lb.	.75	.77
No. 1*	lb.	.71	.73
Ancap*(†)	lb.	.38	.40
Ancatax*(†)	lb.	.48	.50
Ancazate BU (ET & ME)*(†)	lb.	—	1.07
Ancazide ET*(†)	lb.	—	1.07
ME*(†)	lb.	—	1.14
Arazate*	lb.	—	2.25
Arquad 12*	lb.	.55	.61
Beutene*	lb.	.66	.68
Bismate, Rodform*	lb.	—	3.00
Butazate*	lb.	.87	1.04
Butyl Eight*	lb.	1.10	1.35
Butyl Namate	lb.	.45	.50
Captax*	lb.	.44	.46
C-P-B*	lb.	—	1.95
Cumate, Rodform*	lb.	—	1.45
Cydac*		.71	.73
DIBS*		—	.85
Diorthotolyguanidine	lb.	.69	.70
Dipac*	lb.	—	.85
Diphenylguanidine	lb.	.49	.50
Dithiocarbamates Cyzate B & E	lb.	.85	.89
El-Sixty*	lb.	.62	.69
Ethazate*	lb.	—	1.04
50D*	lb.	.87	.89
Ethyl Thiurad*	lb.	—	1.04
Ethyl Tuex*	lb.	—	1.04
Ethylac*	lb.	.93	.95
Guantal*	lb.	.62	.69
Harvex*	lb.	.70	.76
Hepteen Base*	lb.	—	1.85
Kure-Blend MT*	lb.	—	.70
Ledate, Rodform*	lb.	—	1.04
MBT-XXX*	lb.	.55	.57
MBTS Pellets*	lb.	.54	.56
Merac*	lb.	.75	1.05
Mercaptobenzothiazol	lb.	.44	.46
Mercaptobenzothiazyl Disulfide	lb.	.54	.56
Mertax*	lb.	.55	.62
Methazate*	lb.	—	1.04
Monex*	lb.	—	1.14
Mono Thiurad*	lb.	—	1.14
Morfex*	lb.	.65	.67
2-MT	lb.	.88	.90
NA-22* (for neoprene)	lb.	—	1.05
NOBS No. 1*	lb.	.71	.73
Special*	lb.	.75	.77
O-X-A-F	lb.	.55	.57
Pennac SDB*	lb.	.45	.48
Pentex*	lb.	—	1.24
Flour*	lb.	—	.30
Permalux (Neoprene)*	lb.	—	2.25
Phenex*	lb.	.60	.65
Polyac*	lb.	—	1.85
R-2 Crystals*	lb.	—	4.35
Rotax*	lb.	.55	.57
RZ-50-A* and B*	lb.	—	1.00
Santocure*	lb.	.71	.73
NS*	lb.	.71	.73
Selenac* (Ethyl, Methyl)	lb.	—	3.00
Seleram, Ethyl	lb.	—	3.00
Setsit-5*	lb.	.75	1.05
9*	lb.	.85	1.15
SPDX-GH*	lb.	.77	.79
GL*	lb.	1.20	1.30
Tellurac*	lb.	—	1.55
Tepidone*	lb.	.45	.45
Tetrone A*	lb.	—	1.98
Thiate A*	lb.	.88	—
B*	lb.	1.05	1.25
Thiazole ZMBT	lb.	.55	.57
Thiofide*	lb.	.54	.61
S*	lb.	.64	.71
Thionex*	lb.	—	1.14
Thiotax*	lb.	.44	.51
Thiram, Ethyl	lb.	—	1.04
Methyl	lb.	—	1.14
Thiurad*	lb.	—	1.14
Thiuram E*	lb.	—	1.04
M*	lb.	—	1.14
Cyuram DS & MS	lb.	1.14	1.14
Trimene*	lb.	.56	.58
Base*	lb.	1.03	1.06
Triphenyl Guanidine	lb.	—	.90
Tuads* (Ethyl)	lb.	—	1.04
Tuads* (Methyl)	lb.	—	1.14
Tuex*	lb.	—	1.14
Ultex*	lb.	1.15	1.20
Unads*	lb.	—	1.14
Vulcacure NB*	lb.	.45	.45
NS*	lb.	.75	1.05
TMD*	lb.	—	1.14
ZB*, ZE*, ZM*	lb.	.85	.89
Z-B-X*	lb.	—	2.45
Zenite*	lb.	.54	.56
Zenite A*	lb.	.69	.71
Zenite Special*	lb.	.55	.57
Zetax* (uncoated)	lb.	.55	.57
Zimate* (Butyl)	lb.	—	1.04
Zimate* (Ethyl)	lb.	—	1.04
Zimate* (Methyl)	lb.	—	1.04
Zimate Slurry 50% solids content (Butyl, Ethyl & Methyl)	lb.	.85	.89
Ziram, Butyl	lb.	—	1.04
50% Dispersion	lb.	.85	.89
Ziram, Ethyl	lb.	—	1.04
50% Dispersion	lb.	.85	.89
Ziram, Methyl	lb.	—	1.04
50% Dispersion	lb.	.85	.89

ACTIVATORS

Blue Lead Sublimed	lb.	.17¼	.18¼
Cottonseed Fatty Acids			
Drew Wecoline C*	lb.	.17½	.19
Wochem 210* and 211*	lb.	.16¾	.19¼
Fish Oil, Hydrogenated, Fatty Acid			
DAR-S* (dlvd.)	lb.	.12¼	.14¾
DAR-HY* (dlvd.)	lb.	.15¼	.17¾
Hydrofol Acids* (dlvd.)	lb.	.15	.25¼
Hyfac 430* (dlvd.)	lb.	.18	.20½
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	.15¾
Neutrex* (dlvd.)	lb.	.14¼	.18¾
Stearite*	lb.	.11¾	.14¼
Talene*	lb.	.16¼	.18¾
Lime, Hydrated			
Arrowhead*	ton	—	21.00
Marblehead*	ton	—	19.25
Sierra*	ton	—	22.50
Litharge			
Eagle-Picher* (c.l.)	lb.	.18	—
SB* (dlvd.)	lb.	—	.18½
Magnesium Oxide, Heavy			
General Magnesite 500*	lb.	.05½	.06
600*	lb.	.06½	.07
Kaiser 325*	lb.	.057	.073
Michigan No. 15*	lb.	.05½	.06½

ACTIVATORS (Cont'd)

Magnesium Oxide, Light			
Carey Mag*	lb.	.25¼	.26
General Magnesite* (neoprene grade)	lb.	.26¼	.28¾
General Magnesite No. 101*	lb.	.23½	.24½
Genmeg MLW*	lb.	.23½	.24½
K & M* (neoprene grade)	lb.	.29¼	.30
Light Calcined Magnesia No. X-01*	lb.	.25¼	.26
Maglite D*	lb.	.25¼	—
K*	lb.	.25¾	.27
L*	lb.	.29¾	.30¾
M*	lb.	.27	.28½
Marmag*	lb.	.24¾	.26
Michigan No. 30*	lb.	.25¼	.26
Neomag Powder*	lb.	.29¼	.30
Pellets*	lb.	.31¼	.32
Michigan No. 40*	lb.	.29¼	.30
Oleic Acid			
Dar-Chem* 105	lb.	.16¾	.19¼
Drew Wecoline OO*	lb.	.17¾	.19
Emersol 210* (dlvd.)	lb.	.16¾	.19¼
Groco Red Oil	lb.	.16¾	.19¼
Neo-Fat 92-04*	lb.	.20½	.22½
94-04*	lb.	.18½	.20½
Wochem 310, 311	lb.	.16¾	.19¼
Palm Fatty Acids			
Groco 45*	lb.	.15¾	.18¼
Neo-Fat*	lb.	.15¾	.17¾
Wochem 280*	lb.	.15¾	.18¼
281*	lb.	.16¼	.18¾
Potassium Oleate (dms.)	lb.	.48	.73
Drew 24%*	lb.	.20	.73
Red Lead			
Eagle-Picher* (c.l.)	lb.	.19	—
No. 2 RM* (dlvd.)	lb.	—	.18½
Sodium Laurate, 75%	lb.	.64	.89
Sodium Oleate, 75%	lb.	.54	.79
Paste (dms.)	lb.	.39	.64
Sodium Stearate, 75%	lb.	.47	.72
Stearic Acid, Single Pressed			
Emersol 110* (dlvd.)	lb.	.15¾	.18¼
Groco 53*	lb.	.15¾	.18¼
Neo-Fat 18-53*	lb.	.14¾	.16¾
Standard Pearlstearic* (dlvd.)	lb.	.16	.18½
Wochem 730*	lb.	.12¼	.14¾
Stearic Acid, Double Pressed			
Choice Pearlstearic* (dlvd.)	lb.	.16	.18½
Emersol 120* (dlvd.)	lb.	.16¼	.18¾
Groco 54*	lb.	.16¼	.18¾
Hydrofol Acid 444	lb.	.12¼	.14¾
Neo-Fat 18-54*	lb.	.15¼	.17¾
Wecoline 200*	lb.	.14¾	.16
1000*, 1500*	lb.	.12	.13¼
Wochem 731*	lb.	.15¾	.18¼
Stearic Acid, Other			
Extra Pearlstearic* (dlvd.)	lb.	.17¾	.20¼
Groco*	lb.	.12¼	.14¾
Neo-Fat 18*	lb.	.18½	.20½
18-58*	lb.	.14¼	.16¾
18-61*	lb.	.16¼	.18¾
Stearex* (dlvd.)	lb.	.11¾	.13
Stearite*	lb.	.11¼	.13¼
Wecoline 300*	lb.	.15¼	.16½
Wochem 720*	lb.	.11¼	.13¾
721*	lb.	.11¼	.13¾
732*	lb.	.16¼	.18¾
White Lead Basic Carbonate	lb.	.19	.20
White Lead Basic Sulfate	lb.	.17¼	.18¼
Zinc Laurate			
Laurex*	lb.	.33	.34
Zinc Stearate	lb.	.41	.46
Aquazinc K.C.*	lb.	.30	.55
Crown Brand*	lb.	.39	.44

Unclassified Activators

Actifat* (dms.)	lb.	—	.18
Aktone*	lb.	.21¼	.23¼
Barak*	lb.	—	.65
Curade*	lb.	.57	.59
Dibenzo G-M-F	lb.	—	2.60
D-B-A*	lb.	—	1.95
G-M-F*	lb.	—	2.60
Dibutylamine (dlvd.)	lb.	.55½	.56½
MODX*	lb.	.38	.40
Neo Fat 42-07*	lb.	.10¾	.12¼
Ridacto* (dms.)	lb.	.25	.26
Snodotte* (dlvd.)	lb.	.20¼	.22¾
Vimbra	lb.	.32	.38½
Vulklor*	lb.	.88	.98

ANTI-COAGULANTS

Aqua Ammonia* (dms.)	lb.	.031	.035
M.B.M.C.* (l.c.l.)	lb.	.54	.76

Tired of Using Liquids to Control Cures on your Hi Sil Compounds?

TRY POLYMEL ACTISIL

Polymel Actisil is a Powder which can be weighed accurately!

ITEM	A	B	C	D
SBR-1502	100	100	100	100
POLYMEL DX-111	20	20	20	20
POLYMEL ACTISIL	1.25	—	2.50	—
TRIETHANOLAMINE	—	1.25	—	2.50
HI-SIL-233	50	50	50	50
ZINC OXIDE	5	5	5	5
SANTOCURE	1	1	1	1
D.O.T.G.	0.25	0.25	0.25	0.25
STEARIC ACID	3	3	3	3
SULPHUR	2.50	2.50	2.50	2.50
TOTALS	183.00	183.00	184.25	184.25

FOR BEST RESULTS

2½ - 6% (based on the Hi-Sil in the compound) is recommended.

Compounds shown were mixed on laboratory mill with 6 x 12 inch rolls.

Ageing severe due to absence of anti-oxidant in compounds.

CURE: MIN. @ 320° F.	3				6				9				12				15			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
SHORE HDNS.	67-63	67-63	69-66	70-67	69-66	69-66	71-70	71-70	70-68	70-68	72-71	72-71	70-69	70-69	72-71	72-71	71-70	72-71	73-72	73-72
M-300	342	369	428	451	423	425	487	487	462	440	467	437	420	429	470	463	460	473	487	479
M-500	642	656	746	754	799	793	914	946	826	810	860	826	800	801	877	875	883	884	889	905
M-700	1104	1160	1310	1678	1660	1718	1912	2220	1674	1627	1910	1912	1683	1692	1820	2072	1830	1843	1908	2092
TENSILE	1592	1493	1967	2254	2210	2180	2580	2368	2046	1980	2488	2518	2001	2046	2598	2480	1962	2028	2525	2552
% ELONGATION	855	800	830	747	795	750	777	707	745	740	770	733	735	730	777	707	720	730	763	730
% PERMANENT SET	42½	40	45	50	40	37½	45	40	32½	32½	35	37½	30	30	32½	30	27½	27½	30	30
AGED TESTS (24 HRS. @ 100° C. AIR OVEN)																				
SHORE HDNS.	77-76	78-77	76-75	77-76	77-76	78-77	76-75	77-76	77-76	78-77	76-75	77-76	77-76	78-77	76-75	77-76	77-76	78-77	76-75	78-77
M-300	711	695	742	763	705	662	702	707	628	593	600	589	614	583	609	599	623	628	575	592
M-500	1525	1500	1600	1710	1459	1374	1404	1522	1156	1086	1133	1156	1156	1080	1077	1156	1146	1119	1047	1148
TENSILE	1590	1623	1902	1910	1976	1970	2220	1880	1870	1854	2092	2036	1734	2032	2185	1922	1740	1870	2077	2086
% ELONGATION	508	530	515	523	557	565	605	530	610	630	660	613	605	660	695	612	600	640	677	630
% PERMANENT SET	20	20	20	20	17½	20	17½	20	17½	17½	17½	20	17½	15	17½	17½	15	15	17½	17½

PRICES:

2000 Lbs. and Up.....26 cents

1 Drum to 2000 lbs...27 cents

All Prices F.O.B. Baltimore

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In Any Quantity. Write for FREE Sample and Technical Data, Now! It's Polymel for compounding ingredients reinforcing, plasticizing, extending, and processing. Natural and elastomers and RELATED PRODUCTS.

THE Polymel CORPORATION

514-516 ENSOR ST. • BALTIMORE 2, MD.

SALES AGENTS: Summit Chemical Co. Akron, Ohio

ANTI-FOAMING AGENTS

Aero Anti Foam H*	lb.	——	.20
Regular*	lb.	——	.12
Anhydrol 6991*	lb.	.51	.56
D.C. Antifoam A*	lb.	5.45	6.65
Antifoam A Emulsion*	lb.	2.05	2.85
Antifoam AF Emulsion*	lb.	2.05	2.85
Antifoam B*	lb.	.65	1.20
Defoama W-1701*	lb.	——	.12½
Defoamer A-25*	lb.	——	3.00
Defoamer 630*	lb.	——	.14
Deltyl Prime	lb.	.70	.80
Foam-Nix*	lb.	.50	1.25
G-E Antifoam SS-24*; 66*	lb.	5.28	6.65
60 Emulsion*	lb.	2.05	3.75
Igepol CO-210	lb.	——	.36
Kessco X-3* (dms.)	lb.	——	.39
X-180*	lb.	——	.28
X-181*	lb.	——	.36½
Nopco 1407*	lb.	.19½	.21½
1497-V*	lb.	.14¾	.16¾
1907-B*	lb.	.22½	.24½
JMK*	lb.	.48½	.50½
JMU*	lb.	.23¾	.25¾
JMY*	lb.	.21	.23
Pluronic L61*	lb.	.33½	.39
RS-968*	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.35	.50
Tributyl Phosphate (dms.)	lb.	.52½	.53½
UC SAG 47*	lb.	5.25	6.50
470*	lb.	.69	1.20
VL-520*	lb.	2.68	3.50

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	2.00
AgeRite Alba*	lb.	2.40	2.50
Gel*	lb.	.70	.72
Hipar*	lb.	1.05	1.07
H.P.*	lb.	.79	.81
Powder*	lb.	.57	.59
Resin*	lb.	.88	.90
Resin D*	lb.	.57	.59
Spar*	lb.	.57	.59
Stalite & Stalite S*	lb.	.57	.59
Superflex*	lb.	.57	.59
Superlite*	lb.	.57	.59
White*	lb.	1.50	1.60
Akroflex C*	lb.	.85	.87
CD*	lb.	.79	.81
Alcogard 354*	lb.	1.40	1.52
Aminox*	lb.	.57	.59
Antioxidant 425*	lb.	2.47	2.50
Antioxidant 2246*	lb.	1.50	1.53
Antox*	lb.	.59	.61
Aranox*	lb.	——	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special*	lb.	.91	.96
B-L-E*	lb.	.57	.59
B-X-A*	lb.	.55	.57
Catalin CAO No. 1*	lb.	.91	.95
CAO No. 3*	lb.	1.05	1.07
CAO No. 5*	lb.	1.49	1.50
CAO No. 6*	lb.	——	3.20
Deenax*	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.86	1.16
Eugenol C-95%*	lb.	2.30	2.50
Flectol H*	lb.	.57	.64
Flexamine*	lb.	.79	.81
Ionol*	lb.	.57	.60
Neozone A*	lb.	.64	.66
C*	lb.	.86	.88
D*	lb.	.57	.59
Nevastain A*	lb.	.51	.61
B*	lb.	.51	.70
Nullapon BF-12*	lb.	——	.21½
BF-13*	lb.	——	.25½
BF-78*	lb.	——	.55
BF-Acid*	lb.	——	.85
Octamine*	lb.	.57	.59
Oxidex*	lb.	——	3.60
PDA-10*	lb.	.46	.48
Pennox* A, B, C, D	lb.	.57	.72
Permalux*	lb.	——	2.25
Polygard*	lb.	.57	.59
Santoflex AW*	lb.	.71	.78
DD*	lb.	.57	.64
75*	lb.	1.01	1.08
Santovar-A*	lb.	1.55	1.62
Santowhite Crystals*	lb.	1.55	1.62
Santowhite L*	lb.	.57	.64
MK*	lb.	1.25	1.32
Powder*	lb.	1.55	1.62
Sequestrene AA*	lb.	.70	.80
NA2*	lb.	.59	.66
NA3*	lb.	.58	.65
Stabilite*	lb.	.57	.59
Alba*	lb.	.75	.80
FLX*	lb.	.78	.80
L*	lb.	.65	.67
White*	lb.	.57	.59
White Powder*	lb.	.46	.48
Stabilizer No. 1*	lb.	1.55	1.80
Stabilizer No. 9-A*	lb.	.80	1.05
Styphen I*	lb.	.51	.55
Sunolite*	lb.	.16	.22
Tecquinol*	lb.	.82½	.84½
Tannic Acid, Tech.	lb.	.46	.48
Tenamene 3*	lb.	.91	.95
Thermoflex A*	lb.	1.05	1.07
V-G-B*	lb.	.75	.77
Wing-Stay S*; T*	lb.	.56	.67

ANTIOZONANTS

Eastozone* 30, 31, 32	lb.	1.05	1.20
Fura-Tone NC-1008*	lb.	.28	.39
NC-1012*	lb.	.46	.69
Santoflex AW*	lb.	.71	.78
UOP 88* & 288* (dms.)	lb.	1.05	1.07

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.34	.40
Good-rite Vultrol*	lb.	.67	.70
Harcopol 1183*	lb.	.70	.74
Retarder PD*	lb.	.37	.39
W*	lb.	——	.46
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	.38
Arquad S*	lb.	.38	.44
Formaldehyde (dms.)	lb.	.06	.076
G-4* (bbls.)	lb.	1.09	1.29
G-11*	lb.	1.98	2.08
Halane*	lb.	.40	.47
Ortho Cresol (26°—27°)	lb.	.14	.16¼
Preventol GD	lb.	——	1.09
Retarder D*	lb.	.42	.50

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.05	6.50
Webnix 34-L*	lb.	1.25	1.75
57*	lb.	1.50	2.00
69-C*	lb.	1.50	2.00
71*	lb.	1.25	1.75

AROMATICS (DEODORANTS)

Airkem 115*	gal.	——	6.50
122*	gal.	——	6.50
186*	gal.	——	6.50
Alamask AA*	lb.	——	3.00
AF*	lb.	——	2.50
AO*	lb.	——	1.50
AR*	lb.	——	.50
BG*	lb.	——	1.15
BGM*	lb.	——	.60
CY*	lb.	——	2.40
DJ*	lb.	——	3.35
DL*	lb.	——	1.95
H*	lb.	——	5.50
LD*	lb.	——	.75
ND*	lb.	——	2.75
O*	lb.	——	6.50
OS*	lb.	——	5.25
Bouquet 149*	lb.	——	3.00
Coumarin*	lb.	——	3.70
Curodex 19*	lb.	4.75	4.90
188*	lb.	5.75	5.90
198*	lb.	6.75	6.90
Deodorant 65*	lb.	——	1.85
Deodorant L-37*	lb.	2.15	2.25
L-44*	lb.	2.65	2.75
N.L.T.X.*	lb.	1.90	2.00
Deodorant Oil GD 6422*	lb.	1.90	2.20
GD 6423*	lb.	1.60	1.90
GD 6575*	lb.	2.40	2.90
GD 31063*	lb.	2.25	2.75
Ethavan*	lb.	6.20	6.25
Latex Perfume 17326	lb.	——	4.00
18301	lb.	——	3.00
22258	lb.	——	2.50
Naugaromes* (dms.)	lb.	.60	3.00
Neutroleum Delta*	lb.	——	2.25
Gamma*	lb.	——	3.25
Parador A*	lb.	1.80	2.10
C*	lb.	2.00	2.50
E*	lb.	.25	.40
GD 5280*	lb.	2.00	2.50
GD 53481*	lb.	1.70	2.00
Perfume Oil Bouquet Vanilla M*	lb.	1.60	1.70
Rodo No. 0*	lb.	4.00	4.50
No. 10*	lb.	5.00	5.50
Rubbarome* (dms.)	lb.	.60	3.80
Rubber Perfume 12*	lb.	——	4.35
Russian Leather 7*	lb.	——	4.35
Vanillin	lb.	2.75	2.80

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	——	8.00
Better Blend Soda* (c.l., bags)	cwt.	——	2.55
Blowing Agent No. 81105*	lb.	.32	.35
Celogen*	lb.	——	1.95
AZ*	lb.	1.92	1.95
Diazo Amino Benzene	lb.	——	.73
Kempore R-125	lb.	——	1.92
Neo Fat 42-12*	lb.	.10¼	.12¼
Opex 40	lb.	.68	.72
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	2.40
Unicel ND*	lb.	——	.72
S*	lb.	——	.20
Urea	lb.	.06	.07

BONDING AGENTS

Base 6986*	lb.	.27	.32
Braze*	gal.	6.00	9.00
Braze Cover Cement*	gal.	2.50	4.00
Chemlok 201, 203, 220, 401, 607	gal.	5.00	24.00
614	lb.	4.35	4.75
Durez 12987*	lb.	.47½	.51½
Gen-Tac Latex*	lb.	.70	.75
Hylene M*	lb.	1.70	2.00
M-50*	lb.	1.00	1.25
Penacolite B1A*	lb.	——	.95
R-2710*	lb.	——	.95
Pliobond 20*	gal.	2.91	4.23
30*	gal.	3.65	4.97

BONDING AGENTS (Cont'd)

Rex Compounds*	gal.	1.30	1.90
Thixons*	gal.	3.30	9.00
Ty-Ply Q (BN & S)*	gal.	6.75	8.00
Tygobond 30*	gal.	4.10	5.40
40*	gal.	5.80	6.89
41*	gal.	8.65	9.85
45*	gal.	5.75	6.48
Vinculux	gal.	——	4.95

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.00	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Flake	lb.	.07½	.09½
Hydroxyacetic Acid—70% (dms.)	lb.	——	.09½
Zinc Nitrate, Tech. Flake	lb.	——	.20

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	.10¾
M*	lb.	.10½	.11
S*	lb.	.11¾	.12¼
Black Shield 4*	lb.	.09	.09½
No. 5	lb.	.10	.10½
No. 6	lb.	.09	.09½
No. 19	lb.	.11	.11½
L-1404B	lb.	.10½	.11
Carbon Black—See *Reinforcing Agents*			
Cooke 1026*	lb.	——	2.50
Lampblack No. 10*	lb.	.06	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¾	.15
Pure Black Iron Oxide	lb.	.14¼	.14½

Blue

Akron Masterbatches*	lb.	2.23	2.78
Toners*	lb.	2.30	6.35
Blue Powders	lb.	2.20	3.75
Cooke M.B. Blue*	lb.	2.20	3.75
Disco Blues	lb.	2.20	3.45
Monastral Rubber Blue CPL*	lb.	1.95	1.95
PCD, Dispersed*	lb.	——	2.55
Peacoline Blue*	lb.	——	3.85
Ramapo Blue*	lb.	2.75	3.00
Rubber Blue GD* (Disp.)	lb.	——	4.75
Rubber Blue X-1999*	lb.	——	1.90
Rubber Dispersed Blues	lb.	2.52	2.78
Solfast Blue*	lb.	1.60	3.25
Stan-Tone MBS*	lb.	2.20	2.85
GPE*	lb.	——	1.50
PEC*	lb.	.93	1.08
Ultramarine	lb.	.14	.30
Vansul Blue M.B.*	lb.	1.00	2.60

Brown

Brown Iron Oxide	lb.	.15¼	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¾	.16
Stan-Tone GPE*	lb.	——	3.00
Vansul Brown M.B.* (Organic)	lb.	——	2.30

Green

Akron Masterbatches*	lb.	1.38	3.08
Toners*	lb.	1.35	4.95
Cooke M.B. Green*	lb.	1.60	2.80
1013*	lb.	——	2.80
Disco Greens	lb.	1.55	2.80
Green Powders	lb.	1.35	3.95
Monastral Rubber Green GSD* (Dispersed)	lb.	——	2.80
GSL*	lb.	2.20	2.20
Permansa Green CP-1236*	lb.	——	1.45
Pigment Green B*	lb.	1.45	1.45
GL-652D*	lb.	.90	.95
Ramapo Green*	lb.	——	3.50
Rubber Dispersed Greens	lb.	1.23	3.08
Rubber Green FD* (Disp.)	lb.	——	2.05
Rubber Green X-1292*	lb.	——	1.75
Serene Green*	lb.	——	3.50
Solfast Green*	lb.	1.60	3.35
Stan-Tone MBS*	lb.	1.55	3.35
GPE*	lb.	——	3.00
PC*	lb.	2.20	2.25
Vansul Green M.B.*	lb.	1.50	3.00

Maroon

Akron Masterbatches*	lb.	——	4.10
Toners*	lb.	2.00	4.00
Pyrolux Maroon*	lb.	——	3.40
Vansul Maroon M.B.*	lb.	——	3.35

Orange

Akron Masterbatches*	lb.	2.42	2.77
Toners*	lb.	2.82	4.00
Benzidene Orange	lb.	——	3.30
Cooke MB*	lb.	2.25	2.35
1021*	lb.	——	2.25
Dianisidine Orange*	lb.	——	2.85
Disco Oranges	lb.	2.30	2.85
Mercadium X-2667*	lb.	——	1.58
Molybdate Orange	lb.	——	.48
Oswego Orange X2065*	lb.	——	3.15
Rubber Orange OD* (Disp.)	lb.	——	2.25
Stan-Tone Cadmium Dry*	lb.	1.85	4.23
Cadmium Paste*	lb.	2.48	2.80
GPE*	lb.	1.20	4.35
PC*	lb.	.75	.80
Vansul Orange M.B.*	lb.	2.40	2.45

THE CASE OF THE
Customer's Curse
I DON'T GIVE A @!X-#* ABOUT YOUR PROBLEMS WITH CONTAMINATED SOLVENT...YOU MEET YOUR DELIVERY DATES FROM NOW ON OR I'LL CANCEL YOUR @:+!!! CONTRACT!
ONE MORE PRODUCTION HOLD-UP CAUSED BY CONTAMINATED SOLVENT AND YOU'RE THROUGH!!
I THINK I'VE FOUND THE ANSWER, BOSS...SKELLYSOLVE! LES WEBER IS HERE RIGHT NOW!
PURCHASING AGENT
YOU CAN FORGET YOUR PROBLEMS WITH CONTAMINATED SOLVENT WHEN YOU USE SKELLYSOLVE, AND...
...YOU WON'T HAVE ANY TROUBLE WITH LATE DELIVERY, EITHER! HERE'S WHY:
1. Orders phoned direct to Skellysolve plant.
2. 9 out of 10 cars shipped next day.
3. Shipping information sent promptly.
4. Skellysolve is quality-checked during production and before shipping.
5. Technical service backed by over 25 years of Skelly experience.
...LIKE YOU TO MEET THE YOUNG MAN WHO SOLVED OUR PRODUCTION PROBLEM!
SURE GLAD I GOT WISE TO SKELLYSOLVE!
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PURCHASING AGENT

Many companies in your industry depend on Skellysolve for exacting quality, prompt shipment, and expert technical service. Get more complete facts by writing or calling us today at LOgan 1-3575, Kansas City, Missouri.

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SKELLYSOLVE-B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor, in dried compound. Closed cup flash point about -25°F.

SKELLYSOLVE-C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve-B. Closed cup flash point about 13°F.

SKELLYSOLVE-H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve-C is desired. Closed cup flash point about -16°F.

SKELLYSOLVE-L. For general manufacturing operations where a medium evaporation rate is required. Closed cup flash point about 12°F.

SKELLYSOLVE-R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency. Closed cup flash point about -25°F.

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SKELLY OIL COMPANY
TULSA, OKLAHOMA
Industrial Division:
605 West 47th Street, Kansas City 41, Mo.

COLORING AGENTS (Cont'd)

Red

Akron Masterbatches*	lb.	1.00 -	3.53
Toners*	lb.	.88 -	5.60
Arcturus Reds*	lb.	— -	1.35
Antimony Trisulfide	lb.	.72 -	.78
R.M.P. Sulfur Free*	lb.	— -	.78
R.M.P. No. 3*	lb.	— -	.72
Brilliant Toning Reds*	lb.	1.77 -	1.90
Cadmolith Red* (dms.)	lb.	1.94 -	2.87
Cooke M.B. Red*	lb.	1.05 -	3.25
1010*	lb.	— -	1.75
Disco Reds	lb.	1.05 -	3.25
Graphic Red* (dlvd.)	lb.	.98 -	1.03
Kroma Reds*	lb.	.14 -	.15
Lake Red C*	lb.	— -	1.25
Mapico Reds* (50 lb. bags)	lb.	.14¼ -	.14½
Mercadium X-2668 Light*	lb.	— -	1.65
X-2669 Medium Light*	lb.	— -	1.73
X-2670 Medium*	lb.	— -	1.80
X-2671 Dark*	lb.	— -	1.88
Oximony Red Iron Oxide	lb.	.12¾ -	.13
Plasticone Red*	lb.	1.02 -	4.60
Polaris Red*	lb.	— -	1.70
Recco Red Oxide*	lb.	.12 -	.13
Red Iron Oxide, Light	lb.	.13¾ -	.14
Red Powders	lb.	— -	4.40
Rubber Dispersed Reds	lb.	1.47 -	3.58
Rubber Red PBD* (Disp.)	lb.	— -	2.05
2BD, Dispersed*	lb.	— -	2.00
2BL*	lb.	1.24 -	1.24
PBL*	lb.	1.24 -	1.24
Rubanox Reds*	lb.	1.47 -	1.60
Rubber Red CP-339* (dlvd.)	lb.	— -	1.10
Rubber Red X-1148*	lb.	— -	.93
Solfast Red*	lb.	1.47 -	1.80
Stan-Tone MBS*	lb.	1.00 -	3.75
GPE*	lb.	.77 -	3.15
PC*	lb.	1.30 -	2.50
PDS*	lb.	1.40 -	1.55
PVC*	lb.	1.65 -	1.90
Vansul Red M.B.*	lb.	1.05 -	3.35
Watchung Red*	lb.	1.90 -	1.90

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.23¼ -	.23½
20* (50 lb. bags)	lb.	.23¼ -	.23½

White—Lithopone

Eagle-Picher*	lb.	.0800 -	.0975
Permolith*	lb.	.0825 -	.09125
Sunolith*	lb.	.0800 -	.0875

White—Titanium Pigments

Iceberg*	lb.	— -	.02½
Icecap K*	lb.	— -	.03¼
Horse Head Anatase Grades*	lb.	.25½ -	.26½
Rutile Grades*	lb.	.27½ -	.28½
Stan-Tone PC*	lb.	.55 -	.60
Ti-Cal*	lb.	.09 -	.09¾
R-22*, R-25*, R-27*, R-30*	lb.	.09⅜ -	.09⅞
R-60*	lb.	.09⅝ -	.10⅛
Ti-Pure*	lb.	.24½ -	.27½
Anatase Grades*	lb.	.25½ -	.26½
R-100*, R-500*	lb.	.27¼ -	.28½
Titanox A*—all grades (dlvd.)	lb.	.25½ -	.26½
C-50* (dlvd.)	lb.	.14⅛ -	.14⅞
RA* (dlvd.)	lb.	.27½ -	.28½
RA-10* (dlvd.)	lb.	.27½-	.28½
RA-NC* (dlvd.)	lb.	.27½ -	.28½
RC* (dlvd.)	lb.	.09⅝ -	.10⅛
RC-HT* (dlvd.)	lb.	.09⅜ -	.09⅞
Unitane O-110*	lb.	.25½ -	.26½
O-220*	lb.	.25½ -	.26½
O-310*	lb.	.25½ -	.26½
O-410*	lb.	.25½ -	.26½
OR-150*	lb.	.27½ -	.28½
OR-250*	lb.	.27½ -	.28½
OR-340*	lb.	.27½ -	.28½
OR-342*	lb.	.27½ -	.28½
OR-350*	lb.	.27½ -	.28½
OR-540*	lb.	.27½ -	.28½
OR-640*	lb.	.27½ -	.28½
Zopaque*	lb.	.24½ -	.25½
R*	lb.	.26½ -	.27½

White—Zinc Oxide (American Process)

AZODOX 44, 45	lb.	.1450 -	.1550
AZO-ZZZ 11*, 22*, 33*, 44* 55*	lb.	.1450 -	.1550
Eagle-Picher AAA*	lb.	.1450 -	.1550
Horse Head Special*	lb.	.1450 -	.1550
XX*	lb.	.1450 -	.1550
Protox 166*	lb.	.1450 -	.1550
167*	lb.	.1450 -	.1550
267* (pelleted)	lb.	.1450 -	.1550
St. Joe Black Label*	lb.	.1450 -	.1550
Green Label*	lb.	.1450 -	.1550
Red Label*	lb.	.1450 -	.1550
Pelleted	lb.	.1450 -	.1550
Sherwin-Williams Oxide*	lb.	.1350 -	.1450

COLORING AGENTS (Cont'd)

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	— -	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450 -	.1550
Florence Green Seal*	lb.	.1625 -	.1725
Red Seal*	lb.	.1575 -	.1675
White Seal*	lb.	.1675 -	.1775
Kadox 25*	lb.	.1675 -	.1775
15*, 17*, 72* & 515	lb.	.1450 -	.1550
Protox 168*	lb.	.1450 -	.1550
169*	lb.	.1450 -	.1550
268* (pelleted)	lb.	.1450 -	.1550
U.S.P. (cartons)	lb.	.1775 -	.1875
XX-78*	lb.	.1450 -	.1550

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530 -	.2630
Lehigh 35%*	lb.	.15125-	.16125
50%	lb.	.15375-	.16375

Yellow

Akron Masterbatch*	lb.	1.12 -	2.18
Toners*	lb.	2.10 -	6.00
Benzidene-Lightfast	lb.	3.40 -	5.35
Benzidine Yellow	lb.	1.41 -	2.55
Cadmolith Yellow (dms.)	lb.	1.12 -	1.20
Chrome Yellow	lb.	.315 -	.315
Cooke M.B. Yellow 405*	lb.	2.15 -	2.75
105*	lb.	— -	2.15
Disco Yellows	lb.	2.05 -	3.95
Iron Oxide, Pure Light Shades	lb.	.12 -	.12¼
Dark Shades	lb.	.11½ -	.11¾
Mapico Yellow* (50 lb. bags)	lb.	.12 -	.12¼
Rubber Dispersed Yellows	lb.	1.27 -	2.13
Rubber Yellow GD* (disp.)	lb.	— -	2.25
GL*	lb.	— -	1.68
Rubber Yellow X-1940*	lb.	— -	2.35
Stan-Tone Cadmium Dry*	lb.	2.80 -	2.98
Cadmium Paste	lb.	1.77 -	1.79
MBS*	lb.	1.30 -	2.20
GPE*	lb.	.77 -	3.25
PC*	lb.	.55 -	3.40
Toluidine Yellow	lb.	2.20 -	2.20
YL-660 D*	lb.	1.25 -	1.35
Oximony Iron Oxide	lb.	.12¾ -	.13
Vansul Yellow M.B.*	lb.	1.15 -	2.15
Yellow Powders	lb.	2.00 -	5.00
Zinc Yellow	lb.	.29 -	.29

DISPERSING AGENTS

Anchoid*(†)	lb.	.24 -	.25
Anhydrapent*	lb.	.56 -	.59
Armeen 18*	lb.	.39 -	.45
Belloid TD*	lb.	.15¾ -	.16¼
Blancol*	lb.	— -	.15¾
Darvan No. 1*, No. 2*, No. 3*	lb.	.22 -	.35
No. 6*	lb.	.15½ -	.15¾
No. 7*	lb.	.18¾ -	.23¾
Daxad 11* (21*, 23*)	lb.	.08 -	.30
Diethanolamine (dms., dlvd.)	lb.	.24½ -	.27
Dispersaid*	lb.	1.25 -	1.35
Emcol K-8300* (dms.)	lb.	.14 -	.18
P10-59	lb.	.32 -	—
5120	lb.	.31 -	—
5138	lb.	.31 -	—
Emulphor ON-870*	lb.	— -	.55
Furala*	lb.	.06½ -	.07½
Halloid*	lb.	.04½ -	.05½
Igepal CO-630*	lb.	— -	.29
Igepon T-73*	lb.	— -	.29½
Kyro EO* (dms.)	lb.	— -	.29¾
Leonil SA*	lb.	— -	.55
Lipal No. 9-N*	lb.	.28 -	.29
11-O*	lb.	.28 -	.29
Lomar PW*	lb.	.15¼ -	.15¾
Marasperse C*	lb.	.06¼ -	.06¾
CB*	lb.	.13 -	.15
N*	lb.	.09½ -	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25 -	.27½
Naccotan A*	lb.	.16½ -	.17
Nekal BA-75*	lb.	— -	.40
BX-78*	lb.	— -	.64
Nopco 1187-X*	lb.	.15 -	.16
Pluronic F68*	lb.	.38½ -	.44
Polyfon*	lb.	.08 -	.10
R & R 551*	lb.	— -	.28
Rubbex*	lb.	.247 -	.277
Stablex B*	lb.	.50 -	.95
Stan-Chem BQC*	lb.	.12¼ -	.17¼
1067*	lb.	— -	.13½
1471*	lb.	.1687 -	.2187
2251*	lb.	.12¼ -	.17¼
Trenamine D-25*	lb.	.32½ -	.36
Triethanolamine (dms., dlvd.)	lb.	.22 -	.25½
Yelkin TT* (and TTS*)	lb.	.13 -	.16

EXTENDERS

Areco 1071-13B*	lb.	.14½ -	.15½
1073-18B*	lb.	.13½ -	.14½
1294-36B*	lb.	.11½ -	.12½
Car-Bel-Ex-A* (and B*)	lb.	— -	.14
Extender 600*	lb.	— -	.1870
Facile Gum 4A*	lb.	.48 -	.50
Millex*	lb.	— -	.07
W*	lb.	— -	.07

EXTENDERS (Cont'd)

Nopco 2271*	lb.	.16¼ -	.18¾
Polyco 418*	lb.	.17 -	.18
PR-162 Latex Extender*	lb.	— -	.182
Solvitose HDF*	lb.	.22 -	.25
Synprolac*	lb.	.16 -	.23
Synprowax*	lb.	— -	.23
Vistanex MM Grades*	lb.	— -	.35

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.21½ -	1.35
Lionite*	lb.	.16 -	1.27
Pumice	lb.	.03 -	.05
Walnut Shell Grits	ton	60.00 -	110.00
Aluminum Hydrate	lb.	.031 -	.170
Kaiser Alumina*	lb.	.026 -	.059
Aluminum Silicate			
AFD*	ton	29.50 -	36.00
Aluminum Flake*	ton	29.50 -	36.00
Marter White*	ton	18.50 -	30.00
Barium Carbonate (l.c.l.)	ton	109.00 -	126.50
Barytes			
No. 1 Floated, White*	ton	55.00 -	79.85
No. 2 Floated, Un-bleached*	ton	50.00 -	74.85
No. 22 Barytes* (c.l.)	ton	— -	30.00
No. 3805 Barytes*	ton	22.00 -	26.75
Foam A*	ton	— -	55.00
Sparmite*	ton	80.00 -	90.00
XIOR*	ton	80.00 -	90.00
Bentonite (c.l.)	ton	— -	13.50
Argosite Clay* (c.l.)	ton	— -	12.50
Bennett Clay* (c.l.)	ton	— -	32.50
SPV Volclay* (c.l.)	ton	— -	13.50
White Hi-Gel*	ton	— -	65.90
Blanc Fixe	ton	125.00 -	142.00
Calcium Carbonate			
Atomite* (c.l.)	ton	— -	32.50
B.I. White No. 1 (c.l.	ton	— -	10.00
Calcene NC*	ton	80.00 -	100.00
TM*	ton	82.50 -	102.50
Calwhite*	ton	— -	20.00
Camel-Carb*	ton	— -	14.00
Camel-Tex*	ton	— -	22.00
Camel-Wite*	ton	— -	35.00
CCO White*	ton	— -	22.00
Duramite*	ton	— -	20.00
Gamaco* (c.l.)	ton	— -	32.50
Georgia Marble 5-25* (c.l.)	ton	— -	20.00
No. 10 White* (c.l.)	ton	— -	11.00
Kalite*	ton	52.50 -	67.50
Laminar*	ton	— -	30.00
Lexamite* (c.l.)	ton	— -	27.50
Lorite*	ton	30.00 -	36.00
Millical*	ton	38.00 -	53.00
Multifex MM*	ton	117.50 -	137.50
Non-Fer-Al*	ton	35.00 -	50.00
Purecal M*	ton	56.75 -	80.75
SC* (and T*)	ton	110.00 -	125.00
U*	ton	120.00 -	135.00
PPTD* (c.l.)	ton	— -	30.00
Rambo No. 1*	ton	— -	11.50
Snowflake*	ton	— -	20.00
Super Multifex*	ton	167.50 -	187.50
Surfex*	ton	42.00 -	57.00
Suspenso*	ton	38.00 -	43.00
Witcarb Reg.*	ton	60.00 -	85.00
*	ton	117.50 -	140.00
R*	ton	127.50 -	150.00
RC*	ton	117.50 -	140.00
York White*	ton	— -	11.50
Calcium Silicate			
Silene EF*	lb.	.055 -	.065
Calcium Sulfate, Anhydrous			
Snow White Filler*	ton	— -	22.00
Calcium Sulfate Hydrous			
Terra Alba No. 1*	ton	— -	17.00
Chalk Whiting (l.c.l.)	lb.	.01½ -	.01¾
Recco Paris Whiting*	ton	— -	35.00
OMYA Whiting*	ton	— -	30.00
Clay			
Afton Clay*	ton	13.00 -	38.00
Aiken Clay*	ton	14.50 -	—
Alsilite* (c.l.)	ton	30.00 -	45.00
Aluminum Flake*	ton	25.50 -	28.50
Buca* (c.l.)	ton	— -	45.00
Burgess No. 20*	ton	— -	35.00
No. 30*	ton	— -	37.00
Burgess Iceberg*	ton	— -	50.00
Icecap K*	ton	— -	65.00
Catalpo* (c.l.)	ton	— -	35.00
Champion*	ton	— -	14.50
Crown*	ton	— -	14.00
Dixie* (c.l.)	ton	— -	14.50
Franklin Clay—R* (c.l.)	ton	16.00 -	41.50
G. K. Soft*	ton	11.00 -	28.00
Harwick Clays*	ton	21.50 -	77.00
Hi-White R*	ton	14.50 -	—
Kaolloid Clay* (c.l.)	ton	— -	10.50
LGB*	ton	17.50 -	22.50
LGP*	ton	20.00 -	25.00
McNamee* (c.l.)	ton	— -	14.50
Natka 1200	ton	13.00 -	35.00
Par* (c.l.)	ton	— -	12.00
Paragon*	ton	14.50 -	19.50
Pigment 5*	ton	27.50 -	34.50
33*	ton	— -	37.00
Recco* (c.l.)	ton	— -	14.50
Swanee Clay*	ton	— -	12.50
Snobrite*	ton	— -	12.50
Suprex*	ton	14.50 -	19.50
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4200 Clay*	ton	13.00 -	—

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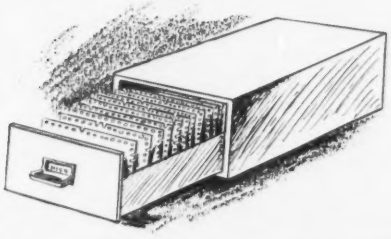

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Rayon, Grey	lb.	——	- .18
Rayon, Pink	lb.	——	- .20
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Ground Softwood Bark			
Silvacon* (c.l.)	ton	55.00	-100.00
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Shredded	lb.	.05	- .17
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Micro Velva A*	ton	49.00	- 51.00
L*	ton	57.00	- 59.00
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K & M Clearcarb*	lb.	——	- .14
Technical* (c.l., eqld.)	lb.	.10½	- .12
Marinco CL*	lb.	.11	- .13
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼	- .07 ⅛
Concord*	lb.	.08	- .08¾
Micro-Mica*	lb.	.08	- .08¾
Mineralite* (c.l.)	ton	40.00	- 85.00
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Triple A Mica* (c.l.)	ton	——	- 35.00
Vermiculite*	lb.	——	- .11
Wet Ground Biotite Mica	lb.	.06½	- .07¼
Wet Ground Mica No. 160*	lb.	.08	- .08¾
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Piqua No. 1 YAA* (c.l.)	ton	10.00	- 10.00
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Snowflake* (c.l.)	ton	——	- 20.00
Stan-White 325*	ton	11.50	- 14.10
Ultrasil*	lb.	.35	- .50
Veroc* (c.l.)	ton	——	- 11.50
Welco* (c.l.)	ton	——	- 10.50
York White R* (c.l)	ton	——	- 11.00
Wood Flour	ton	31.50	- 48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	- 2.35
Black Out*	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.40	- .50
VanWax*	gal.	2.00	- 2.05

FLAME RETARDANTS

Cellulex CEF* (dms.)	lb.	——	- .65
Chlorowax 40*	lb.	.15	- .17½
50*	lb.	.16	- .18½
70*	lb.	.18½	- .20
Halowax*	lb.	.36	- .46
Zinc Borate 3167*	lb.	.1920	- .2020
Zyrox Compounds*	lb.	.38	- .95½

LATEX MODIFIERS

Ludox	lb.	.15	- .16¼
OPD-101*	lb.	.29	- .36
Piccopale A-1 Emulsion	lb.	.086	- .113
Ubatol U-2001* (t.c.)	lb.	.166	- .187
U-2003* (t.c.)	lb.	.184	- .208
U-2007* (t.c.)	lb.	.166	- .187
U-3025* (c.l.)	lb.	.223	- .235
U-3040* (c.l.)	lb.	.260	- .272
U-3045* (c.l.)	lb.	.260	- .272
U-3050* (c.l.)	lb.	.195	- .207

LUBRICANTS, MOLD

Akro Gel*	lb.	——	- .165
Alipal CO-433*	lb.	——	- .20
CO-436*	lb.	——	- .24
Aluminum Stearate Crown Brand*	lb.	.37	- .42
Amine, Mixed Crude*	lb.	.19	- .25
Aquadag*	lb.	3.50	- 4.00
Aquarex D*	lb.	——	- .81
L*	lb.	——	- .94
ME*	lb.	——	- .82
MDL*	lb.	——	- .33
WAQ*	lb.	——	- .22
Armeen HT*	lb.	.34	- .40
180*	lb.	.52	- .56
Armid HT (flaked)*	lb.	.42	- .46
0*	lb.	.39	- .41
Borax, Granular (l.c.l.)	ton	89.00	- 94.00
Carbowax 4000*	lb.	.31	- .32
CD Mold Release B*	gal.	5.00	——
B-2*	gal.	5.00	——
Colite Concentrate* (dms.)	gal.	.90	- 1.15
Colite D43D*	gal.	1.15	- 1.40
Concentrex*	lb.	——	- .25
Dag Dispersions No. 197*	lb.	1.85	- 2.90
D.C. 7 Compound*	lb.	5.05	- 6.50
D.C. Emulsion No. 7*	lb.	1.59	- 2.07
No. 8*	lb.	1.20	- 1.74
No. 35*	lb.	1.20	- 1.74
No. 35A*	lb.	1.20	- 1.74
No. 35B*	lb.	1.20	- 1.74
No. 36*	lb.	1.20	- 1.74
D.C. Mold Release Fluid*	lb.	3.04	- 3.61
Dri-Lube*	lb.	——	- .22
Dryflo* (bags)	lb.	21.40	- 21.55
Emulsion Lubricant A80*	lb.	——	- 1.20
45*	lb.	——	- 1.20
G-E Silicone Emulsion SM-55*	lb.	1.18	- 1.74
SM-61*	lb.	1.18	- 1.74
SM-62*	lb.	1.18	- 1.74
G-E Silicone Fluid SF-92*	lb.	3.04	- 4.25
SF-96*	lb.	3.04	- 4.25
Hawkeye Flake* (dlvd.)	lb.	.15	- .15¾
HSC No. 35*	lb.	1.22	- 2.46
No. 515	lb.	1.22	- 2.46
Igepal CO-430*	lb.	——	- .29
CO-630*	lb.	——	- .29
CO-530*	lb.	——	- .29
Igepon AP-78*	lb.	——	- .48
T-33*	lb.	——	- .21
T-51*	lb.	——	- .13½
Kokobace R*	lb.	.17½	- .18½
Lipal 9-N*	lb.	.28	- .29
7-O*	lb.	.29	- .30
Lubrex	lb.	.25	- .30
Lubri-Flo*	gal.	10.00	- 12.00
Migralube*	lb.	——	- .35
ML-1027-2C*	gal.	——	- 2.65
ML-1028-2C*	gal.	——	- 2.65
Mold Lubricant No. 72 Conc.* (dms.)	gal.	——	- 1.90
Mold Lubricant No. 735* (dms.)	gal.	——	- 1.25
No. 769* (dms.)	gal.	——	- 1.20
No. 825* (dms.)	gal.	——	- 2.00
No. 856* (dms.)	gal.	——	- 1.90
No. 880* (dms.)	gal.	——	- 1.19
No. 887* (dms.)	gal.	——	- 1.80
No. 935* (dms.)	gal.	——	- 1.56
No. 956* (dms.)	gal.	——	- 2.50
No. 965* (dms.)	gal.	——	- 2.15
No. 967* (dms.)	gal.	——	- 2.40
No. 969* (dms.)	gal.	——	- 1.50
No. 970* (dms.)	gal.	——	- 4.50
No. 975* (dms.)	gal.	——	- 2.85
No. 980* (dms.)	gal.	——	- 1.53
No. 987* (dms.)	gal.	——	- 2.45
A 187* (dms.)	gal.	——	- 1.90
A 256* (dms.)	gal.	——	- 1.20
A 988* (dms.)	gal.	——	- 2.60
Moldeze No. 3*	gal.	——	- 4.95
Mold-Brite*	gal.	——	- 1.50
Monopole Oil MD*	lb.	——	- .16
MR-22 Silicone Semi-Permanent	gal.	9.95	- 14.95
Olate Flakes*	lb.	.23½	- .24¼
Orvus WA Paste* (dms.)	lb.	——	- .23¼
Plaskon Polyethylene S*	lb.	.32	- .47
Poly-Brite PE-20 600	lb.	.28	- .42
Poly-Cone 125X	lb.	.42	- .58
1,000	lb.	1.20	- 1.40
Polyglycol 15-200*	lb.	.93	- 1.06
E4000*	lb.	.25	- .28¾
Prodag*	lb.	.31	- .37
Purity Flake* (dlvd.)	lb.	.30	- .52
Rubber-Flo*	gal.	.18¾	- .19¾
Rubber-Glo*	gal.	1.25	- 2.00
Rusco Mold Paste*	lb.	——	- .94
Sericite* (l.c.l.)	ton	65.00	- 75.00
Silicone Oil A145*	lb.	3.22	- 3.61
A220* (dms.)	lb.	——	- 2.80
Silrex (dms.)	lb.	——	- .65
A65*	lb.	2.50	- 2.75

LUBRICANTS, MOLD (Cont'd)

Soybean Lecithin	lb.	.13	- .17
Thermalube*	lb.	——	- .13¾
UC Silicone L-45*	lb.	3.04	- 4.75
L-522*	lb.	2.68	- 3.50
LE-45*	lb.	1.20	- 1.70
LE-450*	lb.	1.20	- 1.70
Ucon Lubricants*	lb.	.26¾	- .27¾
Ulco Mold Soap*	lb.	.19	- .29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	——	- .25
Extrud-o-Lube*	gal.	1.33	- 1.54
G.B. Naphthenic Neutrals*	gal.	.11	- .18
Ivory Chips*	lb.	.19¾	- .20¾
Latex-Lube GR* (dlvd.)	lb.	.19¼	- .20
No. 82-A* (450 lb. dms.)	lb.	——	- .08½
Propylene Stearate (dms.)	lb.	.35	- .60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	- .46
Calcium Stearate	lb.	.39	- .44
Crown Brand*	lb.	.37	- .42
D.C. 7 Compound*	lb.	5.05	- 6.50
D.C. 200 Fluid*	lb.	3.04	- 3.61
ELA*	lb.	——	- .82
G-E Silicone Fluid SF-92*	lb.	3.04	- 4.25
Glycerized Lubricant*	gal.	1.25	- 1.48
Glydag B*	lb.	1.50	- 2.10
Glyso-Lube* (dms.)	lb.	——	- .14
No. 3* (dms.)	lb.	——	- .14
HSC No. 35*	lb.	1.28	- 1.34
No. 515*	lb.	1.28	- 1.34
Hydro-Zinc*	lb.	——	- .20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¼	- .18¼
R-66*	lb.	——	- .16¼
Liqui-Lube* (dlvd.)	lb.	——	- .16¼
N.F.* (dlvd.)	lb.	——	- .16¼
N.T.* (dlvd.)	lb.	——	- .16¼
Lubrex*	lb.	.25	- .30
Lubri-Cote	gal.	.86	- 1.00
Magnesium Stearate	lb.	.42	- .47
Crown Brand*	lb.	.40	- .45
Polyethylene Glycol	lb.	.22	- .26
Rubber Free (Concentrate)*	gal.	——	- 1.44
Jel*	lb.	.18	- .21½
Separex*	lb.	——	- .10½
Slab-Dip* (dms.)	lb.	——	- .17
Soybean Lecithin	lb.	.13	- .17
Stock-Lube*	lb.	——	- .19
UC XL-42*	lb.	3.14	- 4.75
XLE-42*	lb.	1.22	- 1.70
XLE-420*	lb.	1.22	- 1.70
Zinc Stearate	lb.	.41	- .46

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	- 1.65
Alkon* (dlvd.)	lb.	.16	- .16½
CA-301*	gal.	——	- 2.49
CA-302*	gal.	——	- 2.63
G-O 6910*	lb.	.38	- .40
Metso Anhydrous*	cwt.	5.70	- 7.95
Metso 99*	cwt.	5.00	- 7.25
200*	cwt.	6.70	- 8.95
Granular*	cwt.	4.45	- 6.70
Orvus Extra Granules*	lb.	.23¼	- .24¼
Polo*	lb.	.12¾	- ——
Rubber-Sol*	gal.	2.97	- 3.97
Shelblast*	lb.	.04	- .08¼
Sprex A.C.* (dlvd.)	lb.	.17¾	- .18¾
Zip Mold Cleaner*	gal.	1.05	- 1.55

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	- 1.25
Pepton 22 Plasticizer*	lb.	.83	- .86
65*	lb.	1.23	- 1.26
65B*	lb.	.83	- .86
Pitt-Consol 640 (dms.)	lb.	——	- .42
RPA 2*	lb.	——	- .85
3*	lb.	——	- .51
3 Conc.*	lb.	——	- .85
5*	lb.	——	- 1.10
6*	lb.	——	- 1.66

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	——	- .09
Adipol BCA*	lb.	.47	- .47½
2EH*	lb.	.42½	- .43½
10A*	lb.	.42½	- .43½
ODY*	lb.	.45½	- .46½
810*	lb.	.42¼	- .45¼
XX*	lb.	.42½	- .43½
Admex 562 (dms.)	lb.	.50¾	- .51¼
710 (dms.)	lb.	.35¾	- .36¼
711 (dms.)	lb.	.37¾	- .38¼
744 & 745 (dms.)	lb.	.41¾	- .42¼
760 (dms.)	lb.	.59¾	- .60¼
761 (dms.)	lb.	.46¾	- .47¼
770 (dms.)	lb.	.42¼	- .43

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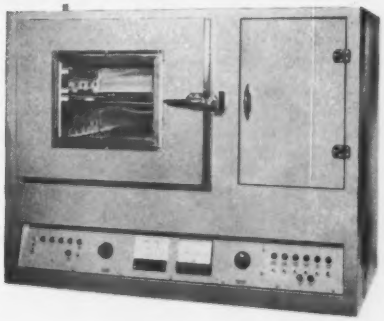
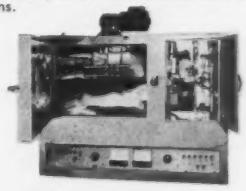


Orec 0300 Series employ an *electronic-chemical loop feed back servo system to achieve and precisely maintain chamber ozone concentrations.



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Anhydrol 6990*	lb.	.51	.56
Arneel SD*	lb.	.34	.40
Arolene 1980* (c.l.)	lb.	——	.10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.06	.07½
Aromatic Tar	gal.	.0573	.1973
Bardol*	lb.	.02¾	.03¾
B*	lb.	.06¼	.06½
Bayol D*	gal.	——	.382
F*	gal.	——	.52
Bearflex 1751*	lb.	.15	.18½
Beeswax, Bleached	lb.	73	.75
Yellow Refined	lb.	.64	.65
Bondogen*	lb.	.55½	.60½
B.R.C. No. 20*	lb.	.0150	.0175
No. 21*	lb.	.02¾	.03
No. 22*	lb.	.02½	.02¾
B.R.H. 2*	lb.	.0213	.0351
BRS 700*	lb.	.0200	.0285
B.R.T. 3*	lb.	.0180	.0265
4*	lb.	.0250	.0260
7*	lb.	.0300	.0310
B.R.V.*	lb.	.0475	.0565
Bunarex Resins*	lb.	.07	.08
Bunatak AH*	lb.	——	.09½
N*	lb.	——	.31
U*	lb.	——	.17½
No. 90*	lb.	——	.09
No. 210*	lb.	——	.14
Butac*	lb.	.12½	.13½
Butyl Carbitol Perlargonate (dms.)	lb.	——	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	——	.68
Butyl Oleate	lb.	.25½	.26½
Butyl Palmitate	lb.	——	.26½
Butyl Stearate (dms.)	lb.	.23½	.25
Califlux 510* (and 550*)	lb.	.02¾	.03¾
G.P.*	lb.	.01½	.02½
R-100*	lb.	.04¾	.05¾
TT*	lb.	.0195	.0295
Candelilla Wax, Prime	lb.	.53	.64
Refined Light	lb.	.56	.57
Carbowax 4000* (dms.)	lb.	.68	.70
Cardolite NC-103*	lb.	.36	.59
Carnauba Wax, Crude	lb.	.72	.74
Flaked	lb.	.73	1.25
Refined, Technical	lb.	.73	.74
Refined, Pure	lb.	.80	.88
Yellow	lb.	1.22	1.26
Celluflex* (dms.)			
112* (t.c., dlvd.)	lb.	——	.32½
179-A* (t.c., dlvd.)	lb.	——	.32½
179-C* (t.c., dlvd.)	lb.	——	.32½
179-EG* (t.c., dlvd.)	lb.	——	.32½
DBP* (t.c., dlvd.)	lb.	——	.30
DOP* (t.c., dlvd.)	lb.	——	.28½
TPP* (dms., eqld.)	lb.	——	.40
Ceresin Wax	lb.	.12	.30
Chlorowax 40*	lb.	.15¼	.17½
50*	lb.	.16	.18½
70*	lb.	.18½	.20
LV*	lb.	.16	.19½
CTLA Polymer*	gal.	.20	.36
Cumar Resins*	lb.	.07	.19
Darex DBM*	lb.	.30½	.34
DBP*	lb.	.30	.33½
DOP*	lb.	.30½	.33½
DIOP*	lb.	.30½	.33½
D.B.M.*	lb.	.32	.34¾
Decylbutyl Phthalate	lb.	.27	.29½
Degras, Common	lb.	——	.14
Diallyl Phthalate	lb.	.51½	.52½
Dibenzyl Sebacate (dms.)	lb.	.93	.93½
Dibutoxyethyl Sebacate	lb.	——	.56¾
Dibutyl Phthalate (dms.)	lb.	.28½	.30
Dibutyl Sebacate	lb.	.67½	.68½
Dicapryl Adipate (dms.)	lb.	.41½	.42½
Dicapryl Phthalate (dms.)	lb.	.29	.30
Dicaprol Sebacate	lb.	.58	.59½
Di-CarbitolPhthalate(dms.)	lb.	.49	.49½
Dicyclohexyl Phthalate	lb.	.58¼	.59¼
Diethyl Phthalate (dms.)	lb.	.27½	.29
Di-2-ethylhexyl Phthalate (dms.)	lb.	.27½	.29
Dihexyl Adipate (dms.)	lb.	.46½	.47½
Dihexyl Phthalate (dms.)	lb.	.32½	.33½
Dihexyl Sebacate (dms.)	lb.	.66	.66½
Diisobutyl Azelate	lb.	——	.47¾
Di-iso-octyl Adipate	lb.	.42½	.44
Dimethyl Phthalate (dms.)	lb.	.27½	.29
Dimethyl Phthalate	lb.	.32	.33
Dimethyl Sebacate (dms.)	lb.	1.30	1.30½
Dinonyl Adipate	lb.	.44½	.47½
Dinopol 235*	lb.	.36	.37
IDO*	lb.	.31	.32
MOP*	lb.	.31½	.32½
Dioctyl Adipate (dms.)	lb.	.42½	.44
Dioctyl Phthalate (dms.)	lb.	.27½	.29
Dioctyl Sebacate (dms.)	lb.	.61¾	.63¼
D.I.O.P. (dms.)	lb.	.27½	.29
Dipolymer Oil	gal.	.33	.48
Dispersing Oil No. 10*	lb.	.06	.06¼
Dutrex* 1, 6, 7	gal.	.18	.23
6H	gal.	.13	——
15E	gal.	.11	.23
20, 25	lb.	.03	.06
33	gal.	.21	.33
Elastex 10-P*	lb.	.30½	.33½
50-B*	lb.	.25	.28
DCHP*	lb.	.59	.60
Emulphor EL-719*	lb.	——	.58
Epoxy Plasticizer	lb.	.33½	.36
Drapex 3.2*	lb.	.39¼	.40¼
Drapex 4.4*	lb.	.34¾	.35¾
Drapex 7.7*	lb.	.37	.38

PLASTICIZERS & SOFTENERS (Cont'd)

Esparto Wax	lb.	——	.55
Estac*	lb.	——	.16
Facile Gum 4A*	lb.	.48	.50
Flexol B-400*	lb.	.27½	.28½
DOP*	lb.	.30½	.31½
TOF*	lb.	.45½	.46½
3GH*	lb.	.46	.46¾
3GO*	lb.	.55	.55¾
4GO*	lb.	.35	.36
426*	lb.	.29½	.30½
Flexricin P-1*	lb.	.33½	.36½
P-4*	lb.	.30½	.33¼
P-6*	lb.	.37	.40
P-8*	lb.	.30¼	.33¼
Fortex A* (dms.)	lb.	.12½	.14½
Fura-Tone NC-1008*	lb.	.28	.39
Galex W-100*	lb.	.15½	.19¼
G.B. Asphaltic Flux*	gal.	.0970	.1770
G.B. Light Process Oil*	lb.	.02¾	.03¾
Medium Process Oil*	lb.	.03¾	.04¼
G.B. Naphthenic Neutrals*	gal.	.12½	.21½
Good-rite GP233*	lb.	.40	.43½
GP235*	lb.	.40	.43½
GP236*	lb.	.40	.43½
GP261*	lb.	.28	.31½
GP265*	lb.	.28½	.32
GP266*	lb.	.29	.32½
GP-266-BPA*	lb.	.29	.32½
Hallco C-255-NS*	gal.	.27½	.29½
C-566*	lb.	.11	.13
Harflex 300* (dms.)	lb.	.60½	.61½
325* (dms.)	lb.	.45	.46
375* (dms.)	lb.	.76	.77
500* (dms.)	lb.	.34	.35
HB20*	lb.	.15	.17
HB40*	lb.	.21	.22
Herron-H.T.*	gal.	.16	.27
Herron-Plas*	lb.	——	.03¼
Herron-Wax*	lb.	.05¼	.06
No. 23*	lb.	.08¼	.08¾
No. 24*	lb.	.07¼	.07¾
HSC No. 13*	lb.	.25	.32
No. 28 and 38*	lb.	.20	.27
Indonex 632½* (633½*, 634½*, 637½*)	gal.	.12	.19
Isooctyl Decyl Phthalate (dms.)	lb.	.28¼	.30
Kapsol*	lb.	.35	.35½
Kenflex A & N*	lb.	.19	.34
Kesscoflex BCL* (dms.)	lb.	——	.37
BCO* (dms.)	lb.	——	.33
BCP* (dms.)	lb.	——	.36
BCS* (dms.)	lb.	——	.32
BO* (dms.)	lb.	——	.28¼
BS* (dms.)	lb.	——	.27½
DBT* (dms.)	lb.	——	.68
DIOA* (dms.)	lb.	——	.43½
DOA* (dms.)	lb.	——	.43½
MCO* (dms.)	lb.	——	.35½
MCP* (dms.)	lb.	——	.41
MCS* (dms.)	lb.	——	.35
TRA* (dms.)	lb	——	.40
KP 23*	lb.	.32½	.33½
90*	lb.	.42½	.43½
140*	lb.	.48	.48½
201*	lb.	.58	.59
220* & 260*	lb.	.35½	.36½
666*	lb.	.59½	.60
Kremol 40*	gal.	.36	.46
50*	gal.	.39	.49
Kromisol* (dms.)	lb.	.36½	.37½
Kronitex AA* (dms.)	lb.	.35	.36
1* (dms.) and K-3*	lb.	.35	.36
MX*	lb.	.35	.36
Lanolin, Tech. Anhydrous	lb.	——	.26
Latex-Lube G.R.*	lb.	.19¼	.20
Lead Oleate	lb.	——	.29¾
Lindol* (dms., t.c.)	lb.	——	.32½
Locusol No. 1-6980*	lb.	.30	.34
2-Mercaptoethanol (dms.)	lb.	1.25	1.50
Methox*	lb.	.40½	.41
Methyl Laurate	lb.	.25	.27
Methyl Oleate	lb.	——	.20
Methyl Stearate (dms.)	lb.	——	.30
Monoplex DOS*	lb.	.59½	.60½
DBS*	lb.	.65½	.66½
S-70*	lb.	.41	.42
S-71*	lb.	.46½	.47½
Montan Wax, Crude	lb.	.22	.29
Flaked	lb.	.29	.29
Morflex*	lb.	.32	.69½
Natac*	lb.	.12	.13
Nebony Resins* (dms.)	lb.	.04½	.05
Neolene 210* (t.c.)	lb.	——	.16
212* (t.c.)	lb.	——	.14
220* (t.c.)	lb.	——	.15
Nerium*	lb.	——	.09
Nevillac Resins* (dms.)	lb.	.31	.85
Neville LX-880* (dms.)	lb.	.12	.13½
LX-685* (dms.)	lb.	.12½	.17½
Neville Resins* (dms.)	lb.	.07¼	.20
Nevindene Resins* (dms.)	lb.	.16½	.20
Nevinol* (dms.)	lb.	——	.24
Nuba 1* (and 2*) (dms.)	lb.	.06¼	.06¾
No. 480 Oil Proof Resin*	lb.	——	.18
Ohopex Q10* (dms.)	lb.	.30½	.31½
R9* (dms.)	lb.	.37¼	.37¾
Ortho-Nitrobiphenyl	lb.	.13	.15
Ozokerite Wax, White and Yellow	lb.	.24	.31
Paradene Resins (dms.)	lb.	.07¼	.08
No. 2 Flaked	lb.	.08	.08½
Para Flux* (dms.)	gal.	.22	.25
2016* (dms.)	gal.	.22	.26
Para Lube* (t.c.l.)	lb.	.046	.048

PLASTICIZERS & SOFTENERS (Cont'd)

Paraplex G-25*	lb.	.76	.77
G-40*	lb.	.50	.51
G-50*	lb.	.40¼	.41¼
G-53*	lb.	.45	.46
G-60* (and G-61*)	lb.	.35	.36
G-62*	lb.	.37	.38
Parmo*	lb.	.06	.13½
Petrolatum (dms.)	lb.	.04¼	.14¼
PG-16*	lb.	——	.35
Philrich-5* (t.c.)	gal.	——	.12½
Picco 10* (and 25*)	lb.	.15	.15½
60* (and 75*)	lb.	.14½	.15
100*	lb.	.14½	.17
Piccocizer 30*	lb.	.05½	.07
Piccolastic A* (B*, C*, D* & E*)	lb.	.24	.25
FT* (FHX* & FX*)	lb.	.1695	.1745
T-135*	lb.	.19	.20
Piccolyte S Resins*	lb.	.20½	.23½
Piccopale Resins*	lb.	.12	.13
Piccoumaron Resins*	lb.	.07	.24½
Pigmentar* Pigmentaroil*	lb.	.0460	.0634
Pitt-Consol 500* (dms.)	lb.	.30	.30½
Plastac M*	lb.	——	.09¼
Plasticizer 2286*	lb.	——	.26¼
Plasticizer 4141*	lb.	.42½	.43½
Plasticizer DP-200, DP-250, DP-520*	lb.	.45	.45¼
DP-316*	lb.	.32¾	.33½
DP-317*	lb.	.46	.47¼
DP-8732*	lb.	.44¾	.46
Plasticizer LP*	lb.	——	.07
Plasticizer MP*	lb.	——	.08
Plasticizer MT-511*	lb.	——	.68¼
Plasticizer ODN*	lb.	.35	.41
Plasticizer SC*	lb.	.40½	.42
Plasticizer W-13*	lb.	.37	.38¼
Plastoflex 3*	lb.	——	.52
52*	lb.	.37¼	.38¼
VS*	lb.	.41¾	.42¾
Plastogen*	lb.	.08¾	.09
Plastolein 9050* (c.l.)	lb.	.54½	.56½
9055*	lb.	.30½	.32½
9058*	lb.	.48	.50
9250*	lb.	.38¼	.40¼
9715*	lb.	.39	.40
Plastone	lb.	.23	.27
Polycizer 162*	lb.	.27½	.28½
332*	lb.	.29	.32½
362*	lb.	.28	.29
662*	lb.	.28	.29½
532 and 632*	lb.	.40	.41¾
ED*	lb.	——	.51
Polyco 438*	lb.	.34	.35
Polymel C-130*	lb.	.13¾	.14¾
D*	lb.	.22½	.23½
6*	lb.	.05¾	.07¾
Poly-Sperse AP-2	lb.	.23	.29½
AP-300, LC-20	lb.	.26	.32½
Poly-Sperse R-100	lb.	.17	.23½
Process Oil C-255* (c.l.)	gal.	.27½	.29½
Propylene Stearate (dms.)	lb.	——	.32
PRR 1*	gal.	.15	.35
PT 101 Pine Tar Oil* (t.c., dms.)	lb.	.0380	.0554
400 Pine Tar* (600* & 800*) (t.c., dms.)	lb.	.0380	.0554
PX-104*	lb.	.30	.32½
PX-108*	lb.	.30½	.33
PX-138*	lb.	.32½	.33½
PX-208* & 238*	lb.	.44½	.45½
PX-404*	lb.	.66	.67
PX-438*	lb.	.60	.61
PX-800*	lb.	.34	.35
PX-917*	lb.	.36½	.37½
RC Plasticizer B-17* (dms.)	lb.	.23½	.24½
O-16* (dms.)	lb.	.30	.31
TG-8*&TG-9* (dms.)	lb.	.34½	.35½
TG-85* (dms.)	lb.	.36½	.37½
RC Polymeric BGA* (dms.)	lb.	.45½	.46½
Reogen*	lb.	.14¼	.14½
465 Resin* (dms.)	lb.	.07½	.08
Resin C*	lb.	.0225	.0310
Resinex*	lb.	.03¾	.05¼
L-4*	lb.	.02¼	.03¼
Rexflex*	lb.	——	.15
Rosin Oil	gal.	.80	1.35
RR-10 (Neoprene)*	lb.	——	.37
R.S.O. Softening Oil*	lb.	.03	.05
RuBars*	lb.	.19¼	.20
Rubberol*	lb.	.18	.25¾
Santicizer B-16*	lb.	.48¾	.49¾
E-15*	lb.	.54	.55
M-17*	lb.	.46	.47
No. 140*	lb.	.35	.36
No. 141*	lb.	.36	.37
No. 160*	lb.	.29	.30
No. 602*	lb.	——	.28½
No. 603*	lb.	——	.27
Sherolatum*	lb.	.03½	.06
Staflex DBES*	lb.	.58	.60½
DOS*	lb.	.58	.60½
IXA*	lb.	.32	.35
KA*	lb.	.36	.38¾
Stan Chlor Oils*	lb.	.13½	.20½
70*	lb.	.17½	.30
Stanolind Petrolatum*	lb.	.07	.156
Wax*	lb.	.31	.33
Sunny South Burgundy Pitch*	lb.	.1030	.1085
Rosin Oil*	gal.	.58	.76
Superla Wax*	lb.	.30	.397
Syncera Wax*	lb.	.16	.267
Syn Tac* (c.l.)	gal.	——	.33
Synthetic Revertant Oil*	lb.	——	.16

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Tar, Refined	gal.	.1200 -	.1760
Tarpine	lb.	.035 -	.050
Terpene A*	gal.	— -	.65
Tetraflex R-122*	lb.	.27 -	.30½
TP-90B*	lb.	.59 -	.69
TP-95*	lb.	.65 -	.75
Transphalt Resins*	lb.	.03¾ -	.05¾
Tributyl Phosphate	lb.	.52½ -	.53½
Tricresyl Phosphate	lb.	.32½ -	.36
Turgum S*	lb.	.10¾ -	.11¾
Turgum SB*	lb.	.07 -	.08
Turpol NC-1200*	lb.	.67 -	.70
NC-1300*	lb.	— -	.50
Vanadiset B*	lb.	.036 -	.07
C*	lb.	.031 -	.06
MR 80 Mesh*	lb.	.08½ -	.12½
Vistac No. 1*	gal.	1.00 -	1.21
P*	lb.	.18 -	.18½
Vopcolene 50*	lb.	— -	.31
Witcizer 100*	lb.	.26 -	.27
200*	lb.	.22¼ -	.25¼
300*	lb.	.30 -	.33½
312*, 313*	lb.	.28 -	.31½
412*	lb.	.42½ -	.46

PROCESSING AIDS

Castor Oil, Blown (dms.)	lb.	.26½ -	.27½
Refined (dms.)	lb.	— -	.18½
Castorwax*	lb.	.25 -	.31
Dutrex 7*	lb.	.12 -	.20
ELA*	lb.	— -	.82
Hydrofol Glycerides 200*	lb.	.15½ -	.19¾
Kenflex N*	lb.	.19 -	.26
Maleic Anhydride	lb.	— -	.27
Millrex*	lb.	— -	.15
Nadic Anhydride	lb.	— -	.75
Polycin*	lb.	— -	.24½
Resin No. 510*	lb.	.19 -	.26
No. 529*	lb.	.25 -	.32
Pulverized*	lb.	.20½ -	.25
Thiomalic Acid	lb.	— -	3.50
Zyrox*	lb.	.78 -	.88

PROTECTIVE & STABILIZING AGENTS

Acacia*	lb.	.12¾ -	.21
Alcogum*	lb.	.08½ -	.24
Alpha Protein	lb.	— -	.23
Aroostoocrat*	lb.	— -	.07½
Carob Bean Flour	lb.	— -	.50
Casein	lb.	.22 -	.35
Emcol K-8300* (dms.)	lb.	.14 -	.18
Ethylene Diamine 68%	lb.	.44 -	.47
Gum Arabic	lb.	— -	.23
Karaya Gum	lb.	— -	.35
Locust Bean Gum	lb.	— -	.50
Prosein*	lb.	— -	.06
Stablex B*	lb.	.50 -	.95
K*	lb.	.27 -	.35

RECLAIMING AGENTS

Amalgamator Z-4*	lb.	.34 -	.35
Armeen C*	lb.	.46 -	.52
Mixed Crude*	lb.	.19 -	.25
T*	lb.	.32 -	.38
Burco RA*	lb	.05 -	.081
BWH-1*	gal.	.17 -	.18
C-6 Oil* (28* & 32*)	gal.	.33 -	.38
C-10 Oil*	gal.	.25 -	.30
C-33* (t.c.)	gal.	— -	.21½
C-42* (t.c.)	gal.	— -	.23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	— -	4.50
Liquid 50% (t.c.)	cwt.	— -	2.80
Solid 76% (c.l., dms.)	cwt.	— -	4.10
Cresylic Acid (99-100%)	gal.	.85 -	1.39
D-4* (t.c.)	gal.	— -	.27
E-5* (t.c.)	gal.	— -	.25
Flake Calcium Chloride (77-80%)	ton	— -	29.00
G.B. Reclaiming Oil*	gal.	.13½ -	.21½
CD-10*	gal.	.11½ -	.19½
CD-50-U*	gal.	.19½ -	.27½
Gensol No. 6* (t.c.)	gal.	— -	.42
Heavy Aromatic Naphtha	gal.	.13¼ -	.18½
LX-77 Reclaiming Solvent*	gal.	.21 -	.33
LX-572 Reclaiming Oil*	gal.	.27 -	.32
LX-777 Reclaiming Oil*	gal.	.23 -	.33
Neo-Fat D-242*	lb.	.05½ -	.07¾
42-70*	lb.	.08¼ -	.10¾
No. 517 H.B. Oil*	gal.	.11½ -	.16½
535*	gal.	.22 -	.27
Nucom* (t.c.)	gal.	— -	.42
Pitt-Consol 500 (dms.)	lb.	.30 -	.30½
640 (dms.)	lb.	.30 -	.30½
PT 101 Pine Tar Oil* (t.c., dms.)	lb.	.0380 -	.0554
Q Oil* (t.c.)	gal.	— -	.286
Reclaiming Oil 3186-G*	gal.	.26 -	.33
Reclaiming Reagent No. 1431*	lb.	.21 -	.25
R.P.A. No. 3*	lb.	— -	.51
RR-10*	lb.	— -	.37
Soda Ash (c.l., bags)	cwt.	— -	1.75
Solvent 534*	gal.	.20½ -	.26½
Solvent Oil 21*	gal.	.24 -	.29
C-42*	gal.	.23 -	.38
X-1 Resinous Oil*	lb.	.0225 -	.0325
701 Oil*	gal.	.27 -	.29

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0775 -	.1550
Croflex*	lb.	.0775 -	.1550
Dixiedensed (and S)*	lb.	.0775 -	.1550
Kosmobile (and S)*	lb.	.0775 -	.1550
Micronex HPC*	lb.	.0775 -	.1550

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0775 -	.1550
Atlantic MPC-95*	lb.	.0775 -	.1550
Continental A*	lb.	.0775 -	.1550
Croflex TH*	lb.	.0775 -	.1550
Dixiedensed HR (and S-66)	lb.	.0775 -	.1550
Kosmobile HM (and S-66)	lb.	.0775 -	.1550
Micronex Standard*	lb.	.0775 -	.1550
Spheron 6*	lb.	.0775 -	.1550
Texas M*	lb.	.0775 -	.1450
Witco No. 1*	lb.	.0775 -	.1550

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0775 -	.1550
Collocarb*	lb.	.0590 -	.1400
Continental AA*	lb.	.0775 -	.1550
Croflex 77*	lb.	.0775 -	.1550
Dixiedensed 77*	lb.	.0775 -	.1550
Kosmobile 77*	lb.	.0775 -	.1550
Micronex W-6*	lb.	.0775 -	.1550
Spheron 9*	lb.	.0775 -	.1550
Texas E*	lb.	.0775 -	.1450
Witco No. 12*	lb.	.0775 -	.1550
Wyex EPC*	lb.	.0775 -	.1550

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2600 -	.3500
Dixie 5 Dustless*	lb.	.1350 -	.2200
Dixie Voltex*	lb.	.2600 -	.3500
Kosmink Dustless*	lb.	.1350 -	.2200
Kosmos Voltex	lb.	.2600 -	.3500
Texas MC-74-BD*	lb.	.2600 -	.3500
Veltex*	lb.	.2600 -	.3500

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0875 -	.1550
Atlantic CF*	lb.	.0925 -	.1600
Continex CF*	lb.	.1100 -	.1700
Croflex CF*	lb.	.0925 -	.1600
Dixie CF*	lb.	.0925 -	.1600
Kosmos CF*	lb.	.0925 -	.1600
Shawinigan Acetylene Black*	lb.	— -	.1900
Vulcan C*	lb.	.1100 -	.1850

Extra-Conductive Furnace Black (ECF) (bags)

Vulcan XC-72 (pellets)*	lb.	.2500 -	.3400

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0675 -	.1350
Atlantic 125*	lb.	.0675 -	.1350
Continex FEF*	lb.	.0675 -	.1350
Croflex 50*	lb.	.0675 -	.1350
Dixie 50*	lb.	.0675 -	.1350
Kosmos 50*	lb.	.0675 -	.1350
Philblack A*	lb.	.0675 -	.1350
Statex M*	lb.	.0675 -	.1350
Sterling SO*	lb.	.0675 -	.1350

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0725 -	.1400
Sterling 99*	lb.	.0725 -	.1400

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0600 -	.1275
Atlantic 118*	lb.	.0600 -	.1275
Continex GPF*	lb.	.0600 -	.1275
Croflex 35*	lb.	.0600 -	.1275
Dixie 35*	lb.	.0600 -	.1275
Kosmos 35*	lb.	.0600 -	.1275
Statex G*	lb.	.0600 -	.1275
Sterling V*	lb.	.0600 -	.1275
V (Non-Staining)	lb.	.0600 -	.1275

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0775 -	.1450
Atlantic 130*	lb.	.0775 -	.1450
Continex HAF*	lb.	.0775 -	.1450
Croflex 60*	lb.	.0775 -	.1450
Dixie 60*	lb.	.0775 -	.1450
Kosmos 60*	lb.	.0775 -	.1450
Philblack O*	lb.	.0775 -	.1450
Statex R*	lb.	.0775 -	.1450
Vulcan 3*	lb.	.0775 -	.1450

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Furnace, High Modulus (HMF) (bags)

Atlantic 120*	lb.	.0625 -	.1300
Continex HMF*	lb.	.0675 -	.1300
Croflex 40*	lb.	.0625 -	.1300
Dixie 40*	lb.	.0625 -	.1300
Kosmos 40*	lb.	.0625 -	.1300
Modulex HMF*	lb.	.0625 -	.1300
Statex 93*	lb.	.0625 -	.1300
Sterling L*	lb.	.0625 -	.1300
LL*	lb.	.0625 -	.1300

Furnace, Semi-Reinforcing (SRF) (bags)

Atlantic 115*	lb.	.0575 -	.1250
Continex SRF*	lb.	.0575 -	.1250
Croflex 20*	lb.	.0575 -	.1250
Dixie 20*	lb.	.0575 -	.1250
Essex SRF*	lb.	.0575 -	.1250
Furnex*	lb.	.0575 -	.1250
Gastex*	lb.	.0625 -	.1350
Kosmos 20*	lb.	.0575 -	.1250
Pelletex*	lb.	.0575 -	.1250
NS*	lb.	.0575 -	.1250
Shawinigan Acetylene Black*	lb.	— -	.1900
Sterling NS*	lb.	.0575 -	.1250
R*	lb.	.0625 -	.1350
S*	lb.	.0575 -	.1250

Furnace Super Abrasion (SAF) (bags)

Atlantic 150*	lb.	.1150 -	.1750
Croflex 85*	lb.	.1150 -	.1750
Dixie 85	lb.	.1150 -	.1750
Kosmos 85	lb.	.1150 -	.1750
Philblack E*	lb.	.1150 -	.1900
Statex 160*	lb.	.1150 -	.1900
Vulcan 9*	lb.	.1150 -	.1900

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0925 -	.1600
Atlantic 135*	lb.	.0925 -	.1600
Continex ISAF*	lb.	.0925 -	.1600
Croflex 70*	lb.	.0925 -	.1600
Dixie 70*	lb.	.0925 -	.1600
Kosmos 70*	lb.	.0925 -	.1600
Philblack I*	lb.	.0925 -	.1600
Statex 125*	lb.	.0925 -	.1600
Vulcan 6*	lb.	.0925 -	.1600

Furnace, Super Conductive (SCF) (bags)

Conductex SC*	lb.	.1150 -	.1800
Vulcan SC*	lb.	.1800 -	.2550

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	— -	.0575
Sterling FT (c.l.)*	lb.	— -	.0575

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	— -	.0250
Sterling MT (c.l.)*	lb.	— -	.0400
MT Non-Staining (c.l.)*	lb.	— -	.0500
Thermax (c.l.)*	lb.	— -	.0400
Stainless (c.l.)	lb.	—	.0500

REINFORCING AGENTS—SILICA

Cab-o-sil*	lb.	.66 -	1.25
D. C. Silica (pelletized)*	lb.	1.45 -	1.65
Hi-Sil 233*	lb.	.08¼ -	.09¾
X303*	lb.	.40 -	.45
Santocel*	lb.	.62 -	.64
Ultrasil VN-3*	lb.	.35 -	.65
Valron Estersil*	lb.	2.00 -	2.25

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	.40 -	.50
Cato* (bags)	lb.	17.00 -	17.15
Darex Copolymer No. 3*	lb.	.47 -	.49
43G*	lb.	.39 -	.41
Darex Copolymer Latex No. 3-L	lb.	.41½ -	.46
Durez 12687 (and 12707)*	lb.	.36½ -	.40
Durez 13355*	lb.	.27½ -	.31½
Good-rite Resin 2097*	lb.	.36 -	.38
2057*	lb.	.30 -	.31
Hystron*	lb.	.39 -	.41
Kralac A-EP*	lb.	.39 -	.41
Lampblack	lb.	— -	.12
Marbon S and S-1*	lb.	.36 -	.43
8000*	lb.	.36 -	.43
Marmix	lb.	.35 -	.43
Mistron Vapor*	ton	— -	70.00
HGO-55*	ton	— -	95.50
Pliolite Latex 150*	lb.	.35 -	.39
Pliolite Resin-Rubber Masterbatches*	lb.	.33 -	.57
Pliolite NR*	lb.	.93 -	.95
S6B*	lb.	.36 -	.43
Plio-Tuf C85C*	lb.	.52 -	.54
Polyco 220*	lb.	.18¼ -	.19¼
Polypol S-70*	lb.	.25 -	.26

TB
with a happy ending

DAVID GRUBIC is three months old. This is the second time his mother has seen him . . . and the first time she has held him. She went to the hospital with TB six months before he was born, and has just returned home.

After her reunion with her family, Mrs. Grubic completed her treatment at home. Her tuberculosis story ended happily.

You can help write happy endings to the stories of 60,000 other families struck by tuberculosis each year. Your Christmas Seal contribution helps finance intensive TB research, discovery of unsuspected cases, health education, and rehabilitation. Please . . . send in your check today.

Fight TB with Christmas Seals

This space contributed to the National Tuberculosis Association and its affiliates by

RUBBER AGE

RETARDERS

Benzoic Acid TBAO-2*	lb.	——	.44
Dutch Boy Normasal*	lb.	——	.46
ESEN*	lb.	.35	.37
Good-rite Vultrol*	lb.	.67	.70
Harcopol 1183*	lb.	.70	.74
Retarder J*	lb.	.68	.70
PD*	lb.	.39	.41
W*	lb.	——	.46
Retardex*	lb.	.46	.46
Wiltrol P	lb.	.39	.41

RUBBER SUBSTITUTES

Mineral Rubber

Byerlyte*	ton	50.00	57.00
Hard Hydrocarbon (dms.)*	ton	53.00	60.00
Herron Flake*	ton	——	45.00
Mineral Rubber, Solid	ton	42.50	44.50
M. R. No. 38*	ton	57.00	70.00

Vulcanized Vegetable Oils

Amberex*	lb.	.29	.56
Brown	lb.	.15	.24
Car-Bel-Lite*	lb.	——	.36
Neophax*	lb.	.17	.27
Polyrez A and C*	lb.	.12	.17
White	lb.	.15	.26
670 Brown	lb.	.14¼	.14¾

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06	.06½
Gilsowax B*	lb.	.09	.11
Resin No. 1098 (dms.)	lb.	——	.62
No. 1198*	lb.	.46¾	.49¾
Tysonite*	lb.	.26	.26¾

SOLVENTS

Acetone (dlvd.)	lb.	.11	.12½
Amsco Lactol Spirits* (t.c.)	gal.	——	.20
Naphthol Spirits*	gal.	——	.19
Mineral Spirits*	gal.	——	.18
Rubber Solvent* (t.c.)	gal.	——	.19
Solv A* (t.c.)	gal.	——	.22
Solv A-80* (t.c.)	gal.	——	.23½
Solv B* (t.c)	gal.	——	.28
Solv B-90* (t.c.)	gal.	——	.31
Solv D* (t.c.)	gal.	——	.30
Solv E*	gal.	——	.30
Solv F*	gal.	——	.30
Solv F-80*	gal.	——	.32
Solv G*	gal.	——	.36
Special Naphtholite* (t.c.)	gal.	——	.19
Special Textile Spirits*	gal.	——	.20
Super Hi-Flash Naphtha*	gal.	——	.34
Super Naphtholite*	gal.	——	.19
Textile Spirits* (t.c.)	gal.	——	.20
Amyl Chlorides, Mixed (l.c.l.) (dms.)	lb.	——	.11
Benzol 90%	gal.	.36	.40
Butyl Acetate	lb.	.17	.18
Butyl Alcohol	lb.	.17	.18
Secondary (dlvd.)	lb.	.15	.16½
Tertiary (dlvd.)	lb.	.15	.16½
Carbon Bisulfide, Tech.	lb.	.0545	.0161
Carbon Tetrachloride	lb.	.10¾	.14¼
Cosol 1*	gal.	.37	.43
2*	gal.	.42	.48
Cyclohexane	gal.	.77	110.00
85% (c.l.) (dms.)	gal.	——	.56
Cyclohexanone	lb.	.29	.31½
Diacetone, Pure (dlvd.)	lb.	.15½	.17
Dichlorethyl Ether (dms.)	lb.	.15½	.16½
Dichloropentanes (l.c.l.) (dms.)	lb.	——	.06
Dicom*	gal.	——	.55
Halowax Oil*	lb.	.28	.41
Heptanes* (t.c.)	gal.	.19	.22
Hexanes (t.c.)	gal.	.19	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.62	.72
Ether, Ref. (dlvd.)	lb.	.09½	.11
Mersol*	gal.	.43	.79
Mesityl Oxide (dlvd.)	lb.	.15	.16½
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.66	.72
Methyl Chloride	lb.	——	.12¾
Methyl Ethyl Ketone	lb.	.15	.16½
Methyl Isobutyl Ketone (dlvd.)	lb.	.17	.18½
Methylene Chloride	lb.	——	.12½
N-5 Pentane Mix* (t.c.)	gal.	——	.13½
N-6 Hexanes* (t.c.)	gal.	——	.14½
N-7 Hexanes* (t.c.)	gal.	——	.13½
Penetrell*	gal.	.42	.63
Perchlorethylene	lb.	——	.11
Petrolene* (t.c.)	gal.	——	.14125
Picolines, Alpha, Refined	lb.	.43½	.44
Mixed	lb.	.32½	.33
Proprietary Solvent (dms.)	gal.	.66	.77
Propyl Acetate (t.c., dlvd.)	lb.	——	.11¾
Alcohol (t.c., dlvd.)	lb.	——	.11
Pyridine, Refined	lb.	.74½	.75
Quinoline	lb.	.50	.54¼
Rubber Solvent (t.c.)	gal.	——	.16
Rubsol (t.c.)	gal.	——	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	——	.158
C (Heptanes)* (t.c.)	gal.	——	.151
R (Rubber Solvent)*	gal.	——	1.29
Solvent, Crude, Light	gal.	.19	.28

SOLVENTS (Cont'd)

Solvesso 100* (t.c.)	gal.	.33	.35
150 (t.c.)	gal.	.33	——
Sunny South DD Dipentine*	gal.	.42	.63
Sunny South DD Pine Oil*	lb.	——	.15
Sunray*	gal.	.1140	.1600
Toluene (dms.)	gal.	——	.38
Toluol (t.c.)	gal.	.33	.35
Trichlorethane	lb.	——	.12¾
Triglycol Dichloride	lb.	.63	.64
Union Thinner 1* (t.c.)	gal.	——	.174
5* (dms.)	gal.	——	.199
7* (t.c.)	gal.	——	.164
2-50 W Hi-Flash*	gal.	——	.41
Xylol	gal.	.34	.38

STABILIZING AGENTS (for Vinyl Resins)

Advastab BC-12*	lb.	.90	.95
BC-74*	lb.	.70	.75
BC-105*	lb.	.75	.80
CH-101*	lb.	.60	.65
CH-201*	lb.	.60	.65
E-82*	lb.	.90	.95
JCX*	lb.	.62	.67
L Paste*	lb.	.65	.70
SN*	lb.	.47	.52
T-10*	lb.	1.90	1.95
T-50-LT*	lb.	3.20	3.25
XBZ-155*	lb.	.69	.74
XC-143*	lb.	.90	.95
XE-98*	lb.	.53	.58
Amioca 50* 85* (bags)	lb.	11.11	11.26
Barca 10*	lb.	.75	.80
Barium Ricinoleate (BVS)	lb.	——	.70
Barium Stearate	lb.	.41	.46
Basic Silicate White Lead	lb.	.16	.17
Cadmium Ricinoleate	lb.	——	2.00
Calcium Ricinoleate	lb.	——	.55
Dutch Boy DS-207*	lb.	——	.54
Plumb-O-Sil A*	lb.	——	.29¾
B*	lb.	——	.31¾
Tribase*	lb.	——	.26½
Dythal*	lb.	——	.39½
Ferro 182* (dms.)	lb.	.70	.76
200* (dms.)	lb.	1.33	1.43
203* (dms.)	lb.	.87	.91
541* (dms.)	lb.	.35½	.45½
541A* (dms.)	lb.	.82	.86
700* (dms.)	lb.	.48¾	.58¾
900* (dms.)	lb.	.90	.94
903* (dms.)	lb.	.60	.64
909* (dms.)	lb.	.91	.95
920*	lb.	——	.98
931* (dms.)	lb.	.75¾	.85¾
993* (dms.)	lb.	.89	.99
1203* (dms.)	lb.	1.30	1.40
1206* (dms.)	lb.	1.32	1.36
1820* (dms.)	lb.	.90	.94
1825* (dms.)	lb.	1.00	1.04
1976*	lb.	.47	.51
Harshaw 1-V-3*	lb.	.43	.45
1-V-4*	lb.	.66½	.70
1-V-7*	lb.	.70	.72
2-V-4*	lb.	.85	.87
2-V-7*	lb.	——	1.10
2-V-8*	lb.	——	1.30
5-V-1*	lb.	.41	.43
7-V-1*	lb.	——	.90
8-V-1*	lb.	.88	.90
8-V-5*	lb.	——	.80
8-V-100*	lb.	.82	.84
9-V-1*	lb.	.70	.72
12-V-5*	lb.	73	.75
24-V-1*	lb.	1.10	1.12
28-V-2*	lb.	——	1.18
128-V-5*	lb.	.86	.88
Kosol* (bags)	lb.	19.00	19.50
Lithium Stearate	lb.	.52	.57
Fluffy	lb.	.47½	.70
Standard	lb.	.52½	.75
Mark A*	lb.	2.80	3.15
C*	lb.	.81	.84
E*	lb.	.72	.75
GS*	lb.	.77	.80
M*	lb.	.59	.62
PL*	lb.	.62	.65
TT*	lb.	.72	.75
WS*	lb.	.97	1.00
X*	lb.	2.50	2.75
XI*	lb.	.87	.90
XV*	lb.	.84	.87
XX*	lb.	.57	.60
Metasap 613-A*	lb.	——	.69
613-B*	lb.	——	.84
613-C*	lb.	——	1.06
621*	lb.	——	.88
624*	lb.	——	.75
633*	lb.	——	.75
635*	lb.	——	.45
Modicol N*	lb.	.42½	.44½
S*	lb.	.30⅞	.32⅞
Sodium Silicates 41°/1:32	cwt.	1.20	2.30
Stabelan E*	lb.	1.40	1.50
XL*	lb.	.55	.65
HR-50*	lb.	.75	.90
HR Liquid*	lb.	.65	.75
HR Paste*	lb.	.85	.95
HR Powder*	lb.	.95	1.05

STABILIZING AGENTS (Cont'd)

No. 110 Liquid	lb.	.65	.75
Istabelan No. 115 Liquid	lb.	.85	.95
No. 120 Liquid	lb.	.65	.75
Stabilizer No. 52*	lb.	1.90	2.00
89X*	lb.	.75	.80
B-5*	lb.	——	.70
E6B*	lb.	——	.95
G-1*	lb.	1.25	1.40
HR*	lb.	.85	.89
L*	lb.	——	.60
OM-10*	lb.	——	1.95
Staflex OY*	lb.	1.00	1.20
QXMA*	lb.	——	.70
Stayrite 10*	lb.	.36	.41
P-10*	lb.	.43	.45
15*	lb.	.55	.57
20*	lb.	.41	.46
22*	lb.	1.00	1.13
25*	lb.	.35	.40
70*	lb.	.70	.72
71*	lb.	.90	.92
75*	lb.	.61	.63
76*	lb.	.53	.55
80*; 90*	lb.	.70	.72
95*	lb.	.70	.73
229*	lb.	.61	.63
Vanstay A* (dms.)	lb.	.50	.53
AB* (dms.)	lb.	.46	.49
AC* (dms.)	lb.	.45	.48
CE* (dms.)	lb.	.44	.47
HT* (dms.)	lb.	.87	.90
HTA* (dms.)	lb.	.97	1.00
HTB* (dms.)	lb.	.70	.73
HTC* (dms.)	lb.	1.09	1.12
HTE* (dms.)	lb.	.80	.83
L* (dms.)	lb.	.32	.35
R* (dms.)	lb.	.67	.70
RR* (dms.)	lb.	.59	.62
RZ-25* (dms.)	lb.	.65	.69
S* (dms.)	lb.	.57	.60
SA* (dms.)	lb.	.81	.84
W* (dms.)	lb.	1.22	1.25
Z* (dms.)	lb.	.62	.65

STIFFENING AGENTS

Polyac*	lb.	——	1.85
Processing Stiffener 710*	lb.	——	.88
Solvitose HDF, H, C-S, T, and E*	lb.	.22	.25
Versatil Gum 8-E*	lb.	.15	.19

SUN CHECKING AGENTS

Allied AA-1144*	lb.	.23	.24
AA-1177*	lb.	.15½	.16½
Antisol*	lb.	——	.23
Antisun* (Chipped)	lb.	.15½	.17½
(Slabbed)	lb.	.15	.17
Heliozone*	lb.	.31	.32
Microflake*	lb.	.20	.24
Nacconol NRSF*	lb.	.40½	.45
NBC*	lb.	——	1.67
Ross Sunproofing Waxes*	lb	——	.15
Sunolite*	lb.	.16	.22
127*	lb.	.16½	.20½
154*	lb.	.23	.25
Sunproof*	lb.	.31	.32
713*; Improved*	lb.	.25	.26
Super*	lb.	.40	.41
Jr.*	lb.	.20	.21
Tonox*	lb.	.52	.54

SURFACE ACTIVE AGENTS

Anhydrapent*	lb.	.56	.59
Anhydrol 6990*	lb.	.51	.56
6991*	lb.	.51	.56
Aquarex D*	lb.	——	.78
G*	lb.	——	.21
MDL*	lb.	——	.33
ME*	lb.	——	.80
NS*	lb.	——	.60
SMO*	lb.	——	.50
WAQ*	lb.	——	.20
Emulphor EL-620*	lb.	——	.40
EL-719*	lb.	——	.58
ON-870*	lb.	——	.55
Hyonics*	lb.	——	.28¾
Igepal CA-630	lb.	——	.29
CO-630	lb.	——	.29
CO-730	lb.	——	.29
CO-850*	lb.	——	.29
CO-880*	lb.	——	.29
Igepon CN-42*	lb.	——	.25
T-33*	lb.	——	.21
T-51*	lb.	——	.13½
T-77*	lb.	——	.49
Kessco 50201*	lb.	——	.44½
50203*	lb.	——	.44¾
18201*	lb.	——	.32
18203*	lb.	——	.35½
Lipal 9-N.* 11-0*	lb.	.28	.29
8-0.* 6-0*	lb.	.29	.30
25C.* 52C*	lb.	.34	.35
15T*	lb.	.23	.24
Pluronic L62*	lb.	.33½	.39
L64*	lb.	.33½	.39
Sellogen Gel*	lb.	——	.12¾
Soybean Lecithin	lb.	.13	.17
Synatol AV-60*	lb.	.28	.29

TACKIFIERS

Amalgamator Z-4*	lb.	.34	.35
Arcco 620-32B*	lb.	.20½	.21½
716-30*	lb.	.18½	.19½
1041-21*	lb.	.16½	.17½

TACKIFIERS (Cont'd)

Arcco A-2t*	lb.	.18	.19
Bunaweld Polymer No. 780*	lb.	—	.24
No. 5514*	lb.	—	.35
Galex* (dms.)	lb.	.16	.18¾
Indopol H-300*	gal.	1.00	1.22
Koresin*	lb.	—	.95
Liquid Rubber Flux*	lb.	—	.14
Nacconal NRSF* (dlvd.)	lb.	.40½	.45
Nilox Resin* (c.l.)	cwt.	—	16.00
PR-162 Resin Emulsion	lb.	.82	—
Resin V	lb.	—	.23½
Synthol*	lb.	.17	.24¾
Vistac A*	lb.	.21½	.22¼
Vistanex LM Grades*	lb.	—	.45
Zirex* (c.l.)	cwt.	—	15.25

THICKENERS (For Latex)

Alcogum AN-6*	lb.	.06	.06½
AN-10*	lb.	.09	.10
AN-25*	lb.	—	.31
PA-15*	lb.	—	.16
Betanol* (dms.)	lb.	.70	.95
CM Starch* (bags)	lb.	26.85	27.00
Gomme Labolene*	lb.	.45	.47
Good-rite K-702*	lb.	.28½	.37
K-704*	lb.	.21	.22
K-705*	lb.	.30	.39
K-707*	lb.	.18	.19
K-708*	lb.	.28	.37
K-710*	lb.	.15	.16
Hycryl A-1000* (t.l.)	lb.	.090	.100
A-2000* (t.l.)	lb.	.335	.360
Hydroseal 3* (bags)	lb.	9.19	9.34
Melojel* (bags)	lb.	6.71	6.86
Modicol VD*	lb.	.13⅜	.14⅜
VE*	lb.	.13⅜	.14⅜
Polyco 296 BT*	lb.	.15	.16
296-N*; 530*	lb.	.15	.16
Propylene Laurate (dms.)	lb.	.57	.82
Sodium Silicate, 41°/1:3.2	cwt.	1.20	2.30
Solvitose Series*	lb.	.22	.25

VULCANIZING AGENTS

Peroxide

Di-cup	lb.	1.10	....
UC XK-1960*	lb.	5.50	—

Selenium

Vandex*	lb.	—	7.00
VA-7*	lb.	—	.50

Sulfur

Blackbird* (c.l.)	cwt.	—	2.85
Cloud* (c.l.)	cwt.	—	2.80
Crystex*	lb.	.19½	.23
Darex Dispersed Sulfur*	lb.	.14	.16

VULCANIZING AGENTS (Cont'd)

Devil A* (c.l.)	cwt.	—	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60*	lb.	.12½	.13
Ko-Blend IS*	lb.	—	.39
Mist* (Wettable) (c.l.)	cwt.	—	4.00
Spider* (c.l.)	cwt.	—	2.80
Star* (c.l.)	cwt.	—	3.25
Sulfasan R*	lb.	1.55	1.57
Tire* (c.l.)	cwt.	—	2.55
Tube* (c.l.)	cwt.	—	4.40
Vultac 2*	lb.	.47	.74
3*	lb.	.51	.78

Tellurium

Telloy*	lb.	—	3.50

WETTING AGENTS

Advawet No. 10*	lb.	—	.17
No. 33*	lb.	—	.48
Aerosol 18*	lb.	.37	.42
AY*	lb.	.75	.80
MA 80%*	lb.	.40	.45
OT 75% Aqueous*	lb.	.40	.45
OT 100%*	lb.	.75	.80
OT-B*	lb.	.65	.70
Alrosol* (dms.)	lb.	.35	.41
Alrosperse*	lb.	—	.18
Anhydrol 6990* and 6991*	lb.	.51	.56
Areskap 50*	lb.	.30	.32
Dry 100*	lb.	.60	.64
Aresket Dry 300*	lb.	.60	.64
Aresklene 375*	lb.	.42	.47
Armacs*	lb.	.28	.77
Arquads*	lb.	.42	.61
Emcol 5100* (dms.)	lb.	—	.31
Energetic W-100	lb.	.28½	.35
Etho-Chemicals*	lb.	.26	.58
Ethomeen S/15*	lb.	.48	.50
T/15*	lb.	.46	.48
Kessco E-122* (dms.)	lb.	—	.45
18201*	lb.	—	.32
Kreelon 4D* (dms.)	lb.	.13	.16
8G* (dms.)	lb.	.26	.28
Kyro EO* (dms.)	lb.	—	.29¾
Modicol N*	lb.	.42½	.44½
S*	lb.	.30⅞	.32⅞
Nacconol SL* (dlvd.)	lb.	.084	.10
60S* (dlvd.)	lb.	.19	.225
Nacconol A* (dlvd.)	lb.	—	.52
Nekal WS-25	lb.	—	.38
WS-99	lb.	—	.95
Orvus AB Granules*	lb.	.16¼	.17¾
Parnol*	lb.	—	.13½
Regal Beads	lb.	.12¾	.16¾
H. D. Beads	lb.	.12¾	.15¾
Santomerse No. 3	lb.	.41	.45
S*	lb.	1.55	1.85

WETTING AGENTS (Cont'd)

Sorapon SF-73*	lb.	—	.18
SF-78*	lb.	—	.30
Sorbit P*	lb.	—	.28
Soybean Lecithin	lb.	.13	.17
Stablex G*	lb.	.50	.90
Tergitol 4* (dms., dlvd.)	lb.	.36½	.37½
7* (dms., dlvd.)	lb.	.43½	.44½
O8* (dms., dlvd.)	lb.	.36½	.37½
P28* (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	—	.15
Vultamol*	lb.	—	.17½
Wetsit Conc.*	lb.	.35	.35

MISCELLANEOUS CHEMICALS

Aquesperse 30*	lb.	—	.11
Arccopel W-18*	lb.	.17	.19
Chiplac Paint	gal.	1.15	5.00
Copper Inhibitor No. 65*	lb.	—	1.57
D-Tac*	lb.	—	.22
2-Ethyl Hexanol	lb.	.23¾	.24¾
Fura-Tone Resin 1226*	lb.	.41	.43
MODX*	lb.	.38	.40
Nacconates* (dms.)	lb.	.99	3.53
Para Resins*	lb.	.04	.04½
Pigmented Filmite* (dlvd.)	lb.	.16¾	—
Resorcin, Tech.	lb.	.77½	.81½
Rio Resin*	lb.	.70	.72
Rongalite CX*	lb.	—	.21½
Sherosopes*	lb.	.13½	.18¾
Sublac Resin PX-5*	lb.	.23½	.24½
Synpep*	lb.	.54	.60
Thiokol LP-205*	lb.	—	4.00
Tysonite*	lb.	.30	.30¾
Vanfre*	gal.	2.45	3.00
No. 3* & No. 4*	gal.	1.95	2.00

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Are Your Materials Listed
in the
Market Prices Section?
Forward full Information
to
Market Editor

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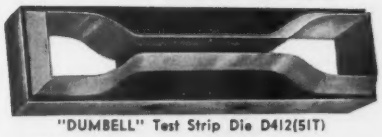
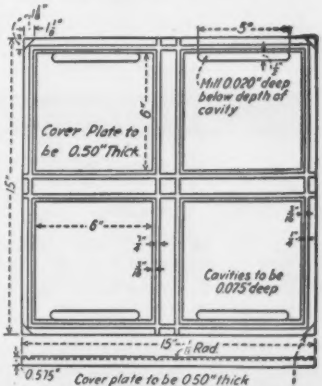
For Rubber Testing and Production



"DUMBELL" Test Strip Die D412(5IT)

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.


5"
Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
6"
6"
Cavities to be 0.075" deep
15" Rod
0.515" Cover plate to be 0.50" thick
Mill four corners ⅛" deep for prying mold apart

SLAB MOLD D15-55

HOGGSON & PETTIS MFG. CO., 141A Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

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SUPERINTENDENT—Extensive background in the manufacturing of mechanical and industrial rubber goods. Excellent chemical and engineering background. Know all types of machinery, processes, quality control and cost reduction. Experienced in factory management, labor relations, product development, compounding and production trouble shooting. Aggressive and full of initiative. Address Box R-474-P, RUBBER AG.

RUBBER COMPOUNDER. Research chemist with more than 15 years (backed by MA degree) in research and development. Broad experience in elastomers from the oldest to the newest. Nearly all end uses, including trade evaluation. Patents, publications (including paper at International Rubber Conference). Currently head of research and development compounding at five-figure annual salary. Want an opportunity for orderly advancement during the next twenty years. Could be available on about two months notice. Address Box R-478-P, RUBBER AGE.

RUBBER TECHNOLOGIST desires responsible position. Eighteen years experience in overall operations. Background includes compounding, development, production, cost estimating, management, etc. Address Box R-479-P, Box 11, RUBBER AGE.

TECHNICAL SALES and/or service to the rubber, plastics and allied industries. Over seventeen years experience in development, compounding, manufacturing, as well as several years technical service and sales. Address R-480-P, RUBBER AGE.

HELP WANTED

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Rapidly expanding precision molded goods manufacturer wants chief chemist with experience in high temperature fuel and oil resistant stocks. Address Box R-463-W, RUBBER AGE.

CHEMIST AND QUALITY CONTROL MANAGER with rubber chemistry background needed by a Los Angeles, California, rubber plant of 100 employees. Affords excellent opportunity to advance career with aggressive and rapidly expanding firm with diversified products. Experience with rubber flooring and color control of great advantage. Age of 30 to 40 preferred. Salary open. Replies confidential. Send photo with complete resumé to Box R-472-W, RUBBER AGE.

TECHNICAL SALES. Young man, chemical degree, with 3-5 years experience in rubber compounding. Articulate with keen desire to sell. Address Box R-475-W, RUBBER AGE.

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One (1) to three (3) years of general compounding and/or processing experience for product development and/or customer service. Good opportunity has been created by promotion. Long established rubber reclaiming manufacturer with excellent pension and hospitalization programs and other benefits. Salary commensurate with experience. Send resumé in confidnce. Address Box R-476-W, RUBBER AGE.

WANTED: Tire Construction Engineer. Eastern tire plant has opening for an experienced tire construction engineer. Must have a minimum of 10 years' experience in passenger and truck tire development and construction. Technical college degree is required. Our employees know of this ad. Address Box R-481-W, RUBBER AGE.

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WANTED: Rubber Technologist with imagination, ingenuity and drive, for product development. Three to five years experience in compounding and processing of molded rubber preferred. Opportunities for growth; good benefits; modern laboratory and latest facilities. North Central New Jersey. Salary open. Send resume to: Personnel Manager, Johns-Manville Research Center, Manville, New Jersey.

HELP WANTED—Continued

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"Help Wanted" continued on next page

HELP WANTED—Continued

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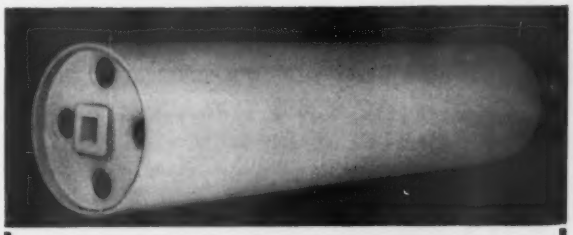

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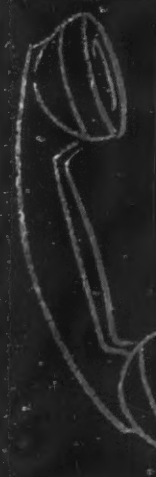

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Extruders in stock: 10″ National-Erie, 6″ Royle with strainer head, 4½″ Royle ball bearing DC motor controls, 4½″ Royle with crosshead, 3½″ NRM late roller bearing drive, 2½″ NEW extruder, 2″ Adamson, 1″ Royle, 14″ x 36″ Farrel top cap, single base motor and drive, 60″ 20 x 22 single base motor and drive water cooled boxes, 3-roll 60″ Farrel calender with 100 DC hp motor, 4-roll 66″ Farrel calender, 3-A body rebuilt, 3 sliding door Banbury complete with 100 hp motor.
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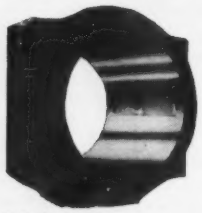

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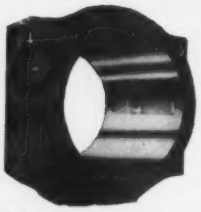

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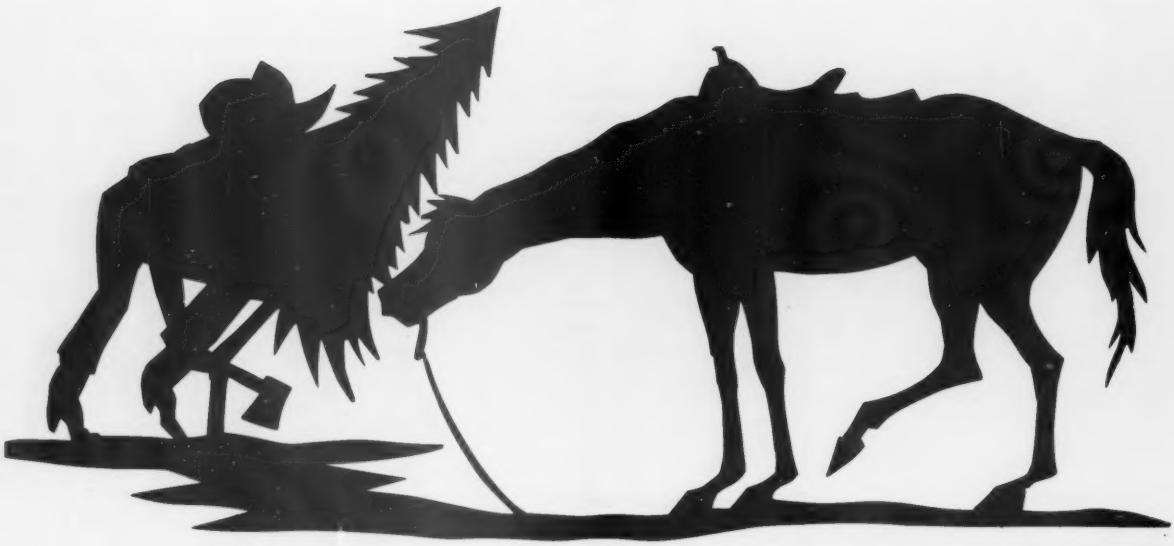

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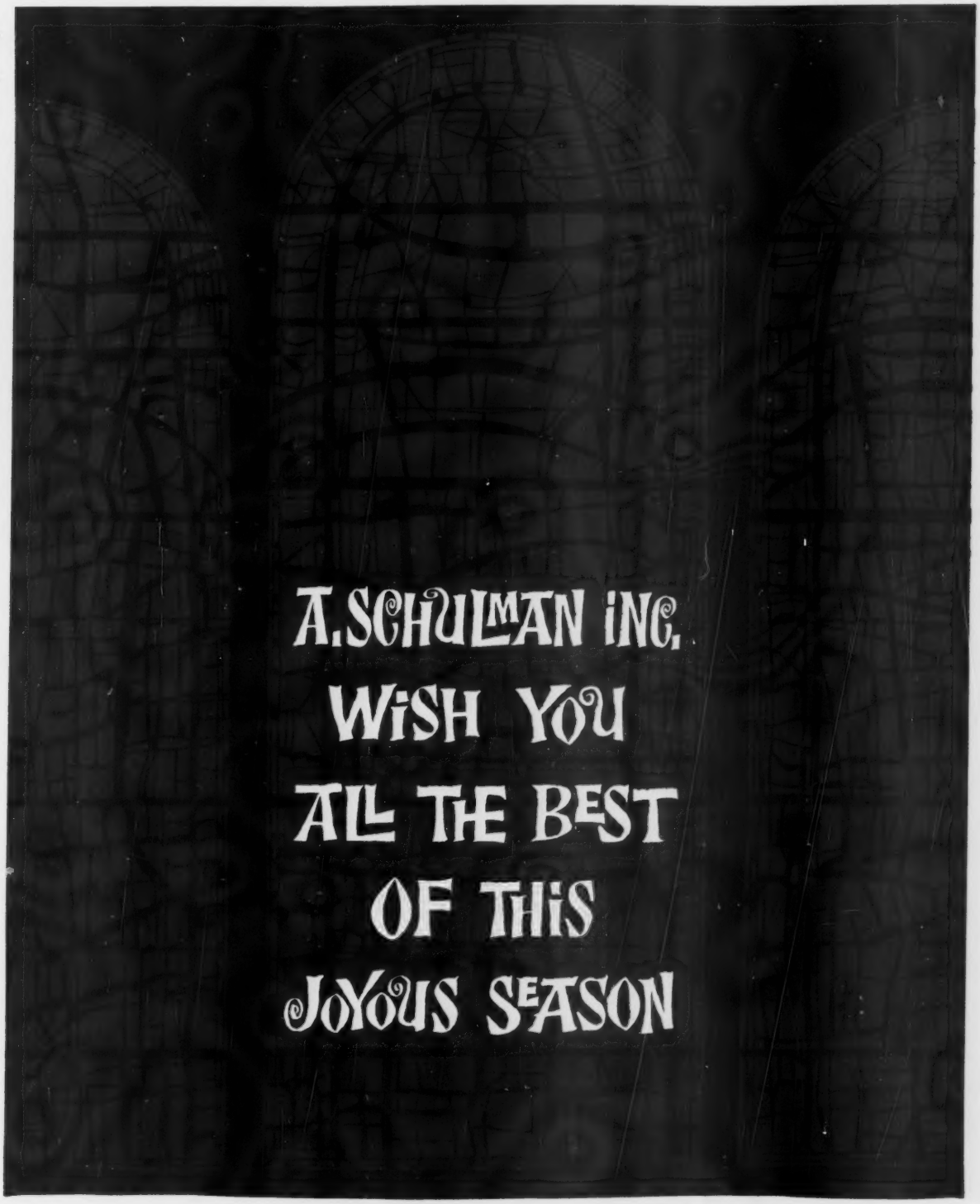

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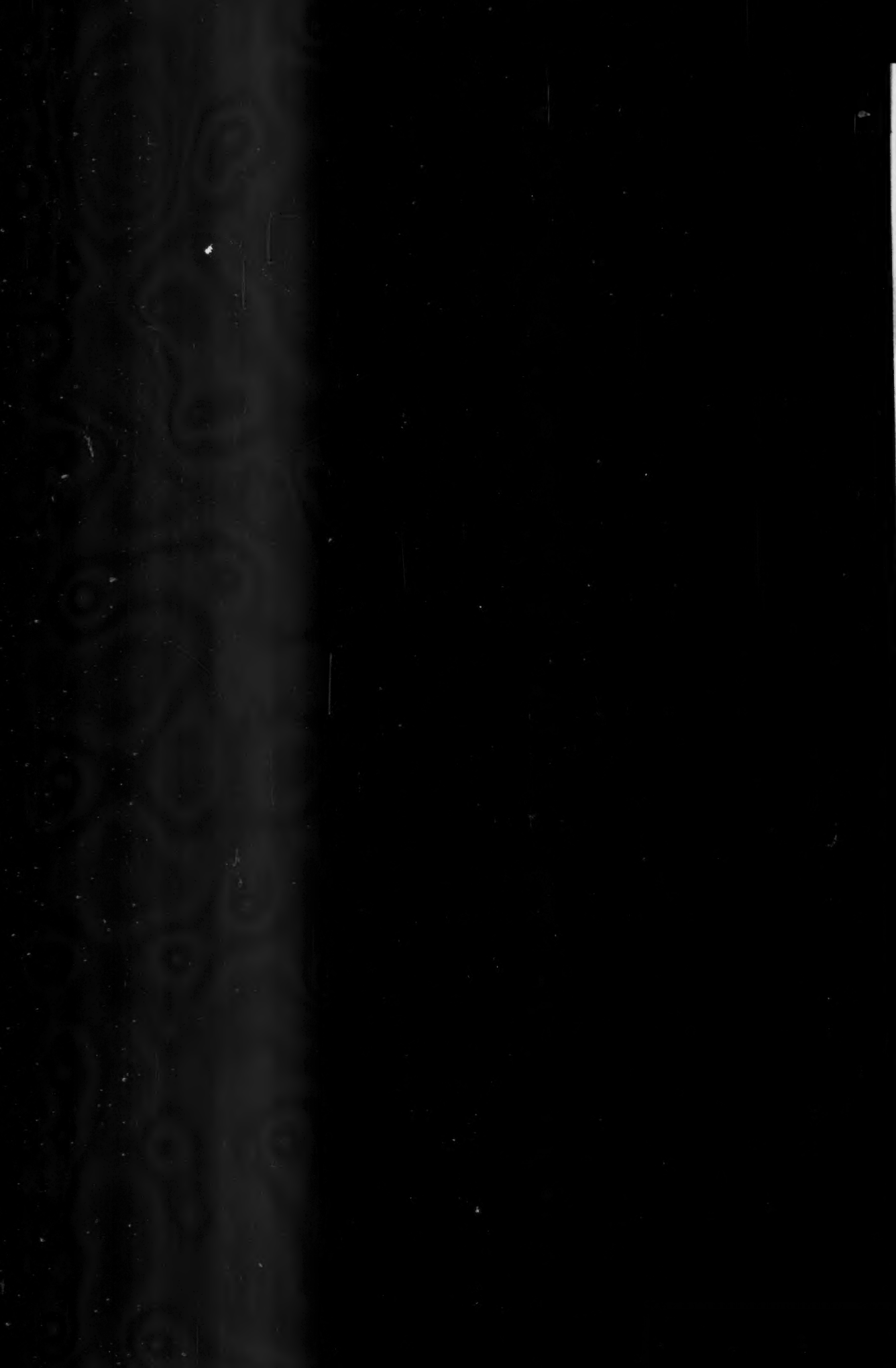

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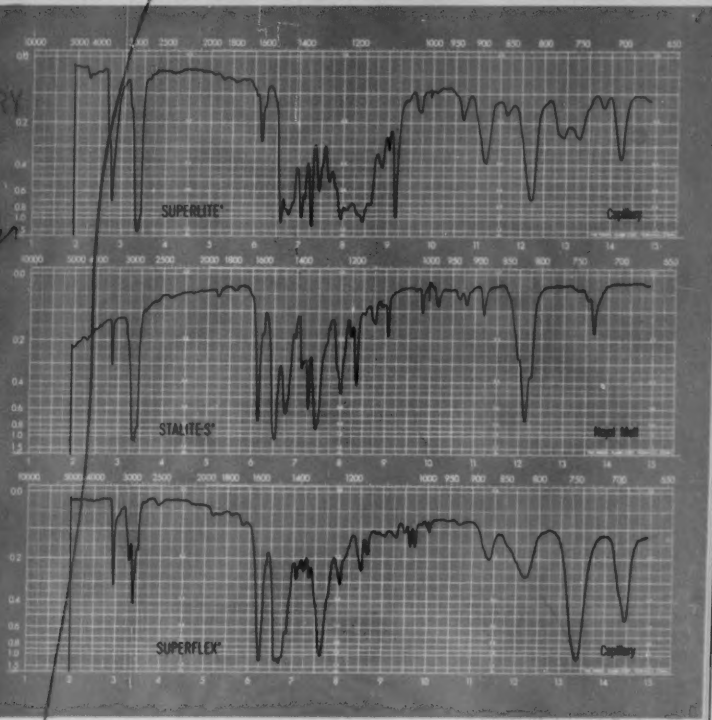

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